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VIEWS, NEWS AND INTERVIEWS.

The Anglo-American Telegraph Company has announced a reduction of $1.06 a word in its cable rate from New York city to Queensland, Australia. The price was formerly $2.56 a word.

The Shoreditch, England, refuse destructor plant was opened by Lord Kelvin on June 28. The object of the plant is to destroy the local refuse, generate electric light and supply hot water to the public baths and laundries. The scheme of operation, in brief, has been described as follows: Carts will convey the street, trade and household refuse to the works, where motor cars and electric hoists will distribute it upon tipping platforms, whence it will be shot by the aid of mechanical feeders into a dozen cells of a destructor, where it will be exposed to a forced blast produced by motor-driven fans, some of which will ventilate an adjacent sewer and blow the gases therefrom into the furnace to help feed the flame. A new system of thermal storage will economize the heat, as, while the destructors must work continuously, an equal production of electricity will not be required. The steam generated will be stored in boilers and used to drive the engines and dynamos and to heat the water to be furnished to the baths and laundries. It is believed that the works will effect a great economy. They will consume yearly 20,000 tons of refuse, which has hitherto been carried to barges and then dumped into the sea at great expense.

Some of the electrical learning contained in the Johns Hopkins University at Baltimore must have leaked over to the Maryland Penitentiary. The convicts are not allowed to have tobacco or matches, and yet they smoked. How they obtained a light for their crudely made cigarettes puzzled the warden. Finally, he discovered that some convicts had obtained two pieces of copper wire, and with these had made connections with the electric-light lines running into the prison. They made the cigarettes out of scraps of tobacco, and then, using a lead pencil as carbon, placed it between the ends of the copper wire, and thereby obtained the required spark.

It is rumored that Mr. D. O. Mills will probably be elected a director of the Brooklyn, N. Y., Rapid Transit Company at the next vacancy. He recently bought $1,000,000 of the company's bonds.

The story comes from Indianapolis that just as a street-car conductor was about to take up a fare the trolley wheel slipped, the pole sprung upward and a loop in the rope caught the conductor under the arm and lifted him over the tailboard. He was landed in a heap on the pavement.

President Frederick Uhlmann, of the Brooklyn, N. Y., Elevated Road, announces that within a year electric cars will be in operation on the road. The third-rail system is to be adopted.

During the recent convention of shriners at Detroit, a trolley party of 3,950 persons was taken for a ride around the city in 67 open cars. This was undoubtedly the largest trolley party in the world.

A large electric installation has recently been completed at Rövos, Norway, according to an English contemporary. There are two large alternate-current dynamos, with a tension of 5,000 volts. The dynamos are directly coupled with the turbines, each of 300 horse-power. The current is conveyed from the machinery house, by means of bright copper wires, to three copper mines, some five to seven miles distant, and is there transformed to 150 volts. The electricity is used both for lighting purposes and for working a considerable amount of machinery. A separate dynamo supplies the requisite electricity for the electric railways. Every precaution has been taken to prevent accidents, the wires being protected where the surroundings make this necessary. The height of the fall is about 50 feet.

THE FIRST STREET CAR USED IN KANSAS CITY.

Two heavy copper wires to be used by the Postal Telegraph Company are being strung in Mexico, one from Laredo, Tex., and the other from El Paso to the City of Mexico. The work will be completed in about three months, and Postal offices will be established in all parts of the country.

The trustees of the village of Depew, N. Y., have granted the application of the Buffalo & Depew Railway Company to build its line within the corporate limits of that village. The line is to be extended to Buffalo, and will be an electric surface road.

Early Street-Car Days in Kansas City.

With the passing of June, the street car mule in Kansas City is a thing of memory only. Not so many years ago he was the autocrat of street-car traffic. With the coming of the first cable, he was given the post of "faithful retainer." Later he became a landmark, and to-day the new electric lines which cover his old stamping ground have made of him a nonentity. The taking off of the last pair of old mules on the Prospect avenue, Southwest boulevard, and "Cannon Ball" routes relegates to the past, so far as Kansas City is concerned, the faithful worker that was its only salvation in street-car travel years ago.

The car mule was first called to his field of usefulness in Kansas City in 1870, when Mr. Nehemiah Holmes, the father of Conway and Walton Holmes, laid what was then part of the first street railway west of the Mississippi, in the line which started from Fourth and Main, and wended its way along Fourth to Walnut, up Twelfth to Grand avenue, and from there to Sixteenth. This was the site of the first car barn, which is still standing. Afterwards the road was extended by stages to Westport, every third car, which bore a white flag, going through to Westport.

Mr. Holmes's sons were the drivers those days, and there was good time made when Mr. "Con." Holmes held the reins and cracked the whip over the backs of the mules, and raced with the driver of the 'bus, the only rival conveyance in those days. As vice-president and general manager of the Metropolitan Street Railway Company, that represents an aggregate outlay of $17,000,000, Messrs. Walton and Conway Holmes can afford to grow reminiscent over the obstacles the first little road had to contend with.

Mr. C. F. Holmes said the other day, musing over the past: "I was chief driver on the road. There were only two of us, Walton and I, until we hired the driver of a 'bus to work for us. Those were exciting days. Many a time I have robbed the cash box of a quarter on the return trip to

get more spikes to lay a few more rails. And often when we got a load of grain or corn, we would tell the man to take his time in putting it away, while we hurried up and made two or three trips to get the necessary wherewithal to pay for it." Now the roads cover 136 miles, and corn is an unknown quantity.

Perhaps the oldest mule in the service of the company, and one that has faced the vicissitudes of earlier times, is "Old Buck," who was purchased by Mr. Holmes when but three years old, and has served the road for 18 years, day in and day out. In that time he has traveled 137,970 miles. He is a type of them all. "Kit" and "Nellie" are next in term of honorable service, each having served 16 years. They were all thoroughly trained and knew their route by heart. Without any word they would stop at either end of the line, turn, and make ready for the return trip. Many journeys had familiarized the road to them. When the three abovementioned mules were thrown out of employment by the new electric cars, many interesting letters were written by people who advocated the pensioning of the three by the company. However, the whole lot, 90 in all, were sold to Captain Tough, who disposed of most of them to southern parties who will work them in the cotton fields. When it came time to take them to the stock yards from the old barns for the last time, a ludicrous and pathetic incident took place. The men whose business it was to drive them down to the stockyards were met with a stubborn resistance on the part of the mules, who refused to leave their old homes. They scattered wildly, and all efforts to drive them were in vain, until they found the bed of the road, when they amiably struck their old gait until they reached the terminus, turned tail and made the return trip.

This was repeated several times, until the idea of driving them was abandoned and the mules were declared victors. Next day, however, the men returned and led each down at the end of a halter, and that was the last glimpse these good, faithful fellows had of their old home. They had been outclassed by electricity.

As one of the vice-presidents of the American Street Railway Association and general manager of this immense street railway system, one of the best in the world, Mr. C. F. Holmes holds a very prominent place in street railway circles. He was largely instrumental in the consolidation of Kansas City railways, and has added greatly to its value and adequate service by his thorough knowledge of its departments and his excellent executive ability. We are indebted to the *Horse Show Monthly* for the illustration on the preceding page.

Proper Respect.

"I have here," said the pallid young man, "a few jokes on the man who does not advertise."

"Young man," said the editor, severely, "we never jest about the dead."—*Typographical Journal.*

A COMPLICATED LEGAL QUESTION.

BY HAROLD N. MOYER, M. D.

A case involving some close legal rulings was recently tried in one of the circuit courts of Illinois.

The case, in brief, was as follows: Two corporations were defendants in a joint action for a personal injury in which the plaintiff endeavored to recover because he had received a "tremendous" shock of electricity, by which, according to legal verbiage, he was then and there rendered sick, sore, and disabled, and from thence hitherto.

The defendant corporations will be designated by the letters A and B. A was operating a suburban electric line, and B the main or central traction system. The train on which the accident occurred was composed of three cars. The front, or motor car, and the first trailer belonged to B, while the last, or second trailer, belonged to A. There was no evidence that B stood in the relation of a common carrier or assumed any obligations toward the passengers in the third car, but merely hauled this car as a part of the train; both it and the passengers remaining under the care of the conductor, or agent, of A.

The plaintiff in this action signaled the train at a regular stopping place and entered the last car, that belonging to A. The conductor then informed him that if he desired to ride to the center of the city it would be necessary for him to pay two fares, as no transfer was given from his car, but by taking the car ahead he could complete his journey for one fare. The plaintiff, not waiting for the car to stop, attempted to pass from the foot-board of the car to that next in front. While in this situation, with one hand grasping the handle of the middle car and the other holding the handle of the last car, he received the "tremendous" shock as stated. The evidence was that his feet slipped from the foot-board and he was dragged a short distance before the car could be stopped. There was no claim of permanency for any other injury than that due to the passage of the electric current.

It will be seen that the shock was received while he was between the cars, one of which was owned by A and the other by B. There was no question as to his being a passenger on the car of A, but they claimed that he had left their car, while B claimed that he was not a passenger on their car as they had not stopped to receive him, and that he was entering the car in a dangerous and unusual manner. Unquestionably no attempt would have been made to maintain an action in this case had there been a simple fall, as the plaintiff voluntarily assumed the risks of a dangerous position, a danger that could easily have been avoided. The plaintiff's contention was that this passage was safe and could have been made had it not been for the electric current passing between the handles of the cars.

It was admitted that the only source of electricity was from the forward car, and the question naturally raised was—How did the current get through the man's body? The day of the accident was dry and warm. The street on which it occurred had been recently paved with wooden blocks. All newly paved streets of this kind are covered with a thick layer of gravel and sand. This had collected on the tracks so that the contact between the rails and wheels was very imperfect. An effort was made to reproduce these conditions under circumstances as favorable to the plaintiff's contention as could be devised. The same cars were used as on the day of the accident, coupled in the same way and a section of track sanded and graveled. The first two cars were run onto this section, and the rear car was left on the bare rails. By moving the cars a few inches a stop could now and again be made, in which a Weston voltmeter would measure from 450 to 470 volts, practically the entire current passing through the first two car bodies and back through the wheels of the last car to the rail. With the cars in motion no definite readings could be obtained owing to the varying pressure. This was due to the lateral vibration of the cars and the consequent contact of the flanges of the wheels with the rails. In none of the trials with the cars in motion did the extreme swing of the needle exceed 150 volts, which marks the limit of the shock received by the plaintiff, unless the conditions attending rapid running, and which we could not imitate, would materially vitiate our conclusions. The fact that the last car was on *bare rails* in the experiment leads one to think that the shock experienced must have been less than 150 volts, as the insulation of the wheels was practically the same for all the cars at the time when the accident occurred.

The question of negligence was not raised in the case, as the judge instructed the jury to find the issues for the defendant at the close of the plaintiff's case. In instructing the jury the judge said that the plaintiff had voluntarily placed himself in a precarious position and thereby assumed all danger, both seen and unseen. Had he remained in his seat until the car stopped he could have safely changed from one to the other car.

There were several interesting points that were not raised in the case. For example, the car bodies presented practically no resistance to the current as we determined in our experiments. How far would the presence of by-currents in handles or other parts of car be negligence? Could these be done away with? There is little doubt but that a drawbar can be insulated as can handlebars. The failure to use such appliances would undoubtedly be construed as negligence. Granting this, still the current that could possibly have passed from hand to hand of this person was entirely insufficient to have caused permanent changes in nerve and muscle.

ELECTRIC RAILWAY NOTES.

The local railways running out of Cincinnati have agreed to meet the competition of electric railways by reducing fares to all competitive points.

The Metropolitan Street Railway Company of New York city announces an issue of $12,500,000 five-per-cent, gold, general mortgage bonds for improvement purposes.

On June 17 the West End Street Railway Company of Boston carried over 800,000 passengers, and it is estimated that this year the West End will show an average daily traffic of close on to 500,000 passengers.

The Exeter Electric Street Railway, running from Exeter, N. H., to Hampton Beach, was formally opened on July 5, for about six miles and the remaining six miles, it is expected, will be in running order by July 15.

At Reading, Pa., on June 26, Leroy Hilberton, a boy of 12 years, was placed under $1,000 bail to answer the charge of changing the signals along the route of the electric railway to Carsonia Park. The penalty, under the code of 1860, is a fine not exceeding $1,000 and imprisonment not exceeding 10 years.

A mortgage was filed on July 7 by the Cripple Creek District Railroad Company to secure the payment of $500,000 bonds to the Central Trust Company of New York. The bonds are in gold, and bear five per cent interest. The money thus obtained is to construct a trolley railroad through the Cripple Creek, Colo., gold districts.

President John Lowber Welsh of the Union Traction Company, of Philadelphia, is reported to have said that at a meeting of the Executive Committee of the company held on July 6, the finances of the road were carefully examined and were found to be in such a satisfactory condition that the stockholders would not be called upon to pay an installment on their stock during the present year.

The traffic on the Nassau and Brooklyn Heights trolley lines, in Brooklyn, N. Y., on July 4 and 5, was the largest that either company has ever handled in two days. On July 4 the Nassau roads carried 275,000 people, and on July 5, 250,000. The Brooklyn Heights system had 325,000 fares on the 5th and 328,999 on the 4th, making a total of 1,178,999 persons carried by Brooklyn's trolley lines in the two days.

At a recent meeting of the New York City Rapid Transit Commission, President Orr and Commissioners George L. Rives and Charles Stewart Smith were appointed a committee to frame the detailed plans and specifications for the construction of the underground road, and to prepare the form of contract for its construction and operation. The committee was also authorized to consult with any person who may desire to enter into the contract of building the road, and to incur such expense as may be necessary to carry on its work.

General Electric Company's New Street Railway Motor.

The General Electric Company announces a new street-railway motor of less capacity than the now well known G. E. 1,000, but of greater capacity than the familiar G. E. 800. As in the nomenclature of its railway motors, the General Electric Company has abandoned the method formerly derived from the draw-bar pull and has adopted an arbitrary nomenclature; the present motor is known as the G. E. 52. Its design is along lines dictated by years of experience, and no pains have been spared to make it light in weight, compact in form and simple in construction, while retaining all the excellent features of the G. E. 1,000 motor.

The G. E. 52 motor has an output of 28 horse-power, rated according to the G. E. standard basis; i. e., a maximum rise of 75 degrees centigrade in the temperature of the windings after a run of one hour at rated load, the temperature of the surrounding air not exceeding 25 degrees centigrade.

The G. E. 52 motor is intended only for ordinary street-railway work and is not recommended for the heavier service to which the G. E. 1,000 motor is adapted, and will accommodate electric brakes; but as some additional capacity is required for brake service, the company does not recommend this motor for such work except in purely street-railway service.

The frame is of steel, cast in two bowl-shaped pieces and hinged and bolted in such a manner that the motor is practically water and dust proof. A handhole, fitted with cover plate and gasket, is let into the lower half, directly beneath the commutator, permitting easy access to the bottom of the motor for inspection or for the removal of any foreign substance. The motor has four poles, each with its own coil. The pole pieces—and in this feature the motor differs from the G.E. 1,000—are laminated, but are bolted to the frame in the same manner as in the G. E. 1,000, the bolts extending through the frame.

A large percentage of the cost of motor maintenance is due to the expense of renewing the bearing linings, and too much attention can not be bestowed upon the design of those. The large bearing surface of this motor is one of its most important features. The armature bearings, designed for the use of oil or grease, or both, are of the following dimensions: Pinion end, seven and three-quarter inches by two and three-quarter inches; commutator end, six and three-eighth inches by two and one-half inches; and are constructed on the "outboard" plan. The upper support for the lining is cast with the upper half of the motor frame, and when the lining is in place there is a space of one inch in the cored recess between the inner end of the lining and the motor frame. This space is occupied by a combination thrust collar and oil guard. The thrust collar is extended through the motor frame into the recess, where it acts as an oil guard. This portion of the collar is a tapered disk six and one-half inches in diameter. The lower support for the lining is a cap bolted to the upper half, but not inclosing the lower half, of the oil guard. This allows free outlet to the oil or grease. With this construction it is impossible for the lubricant to work into the motor. The upper grease or oil-cups are of ample size, and are provided with wicks or wipers, which wipe the shaft through openings cut in the linings. The axle bearings are also fitted with two wipers to each bearing.

The field coils are wound with asbestos-covered wire and "mummified." Each is held in place on its respective pole by means of the pole-piece projections, supplemented by a spring steel plate, and is placed in position before the pole piece is bolted to the frame. For convenience in car wiring and opening for motors, the field connections between the upper and lower fields have been made on the outside of this motor, and both the field and armature leads are brought out at the front of the motor as in the G. E. 1,000 motor.

The armature is of the well known iron-clad, hollow-core type, 11 inches in diameter, with a spread of nine inches. The core is built up of well annealed laminæ, and, to increase the circulation of the air, is provided with three ventilating ducts as in the G. E. generator armatures. The armature has no spider, but it is assembled directly on the shaft. There are 29 slots in its periphery, each slot containing three coils formed into a compact unit; consequently there are 29 sets of coils and 87 commutator bars. The small number of coils is of special advantage in the matter of armature repairs, while the method of forming them in groups of three admits of a substantial insulation of high quality. The comparatively small weight of the armature and its consequent small inertia will be readily appreciated, as it is well known that the stored energy in the mass of an armature must be overcome by means of the brake, when the car is brought to a stop.

The standard gear ratio is 4.78, with taper-bore pinion having 14 teeth and a cast-steel gear having 67 teeth. Higher speed gear ratios may be used, furnishing increased speed with proportionately decreased tractive effort.

The commutator is constructed on the same lines as that for the G. E. 1,000 motor. The segments are of hard-drawn copper, one and thirteen-sixteenth inches deep, allowing a wearing depth of one inch. In assembling, clamping bolts have been dispensed with, and the clamping ring is held in place by a ring-nut.

The brush holders are standard, and staggered to prevent the wearing of ridges in the center of the commutator. Each holder contains two radial brushes two and one-fourth inches long, one and one-fourth inches wide and one-half inch thick. The brush holder yoke is carefully treated with an insulating compound and rubbed to an enamel finish, preventing the lodging of carbon dust.

The suspension can be either the nose, the yoke or the side bar, as with the G. E. 1,000 motor. The yoke suspension is especially recommended, as, with this suspension, the weight of the motor is carried on springs placed upon the side frames of the car trucks. Lugs are cast on the upper half of the motor frame, to which the suspension bar is bolted, the motor being suspended from the top half. This permits easy access for inspection or repairs, as the lower half can be swung down into the pit without disturbing the upper half, which remains suspended from the axle and suspension yoke. The same adjustable axle collar is furnished as with the G. E. 1,000 motor.

When the motor is mounted on 33-inch wheels, the clearance between the bottom of the motor and the top of the track rails is five and seven-eighth inches. The clearance between the bottom of the gear-case and the top of the track rail is four and five-eighth inches, a feature which railway men will appreciate.

The motor, without gear or gear-case, weighs 1,460 pounds; complete, with 67-tooth gear and malleable iron gear-case, the weight is 1,725 pounds.

FIGS. 1, 2 AND 3.—GENERAL ELECTRIC COMPANY'S NEW STREET RAILWAY MOTOR.

Partridge Carbon Company.

The Partridge Carbon Company, of Sandusky, Ohio, manufacturers of carbon motor and generator brushes and battery materials, are doing a rushing business, and, in fact, their trade at the present time is larger than ever before. Mr. J. S. Speer, the popular secretary of the company, is feeling pretty good just now because, as he says, "consumers are finding out that there is but one good self-lubricating carbon brush on the market, and that is the Partridge."

Connecticut State Electrical Association.

The semi-annual meeting of the Connecticut State Electrical Association was held at the Branford Point House, Branford, Ct., on July 9. The meeting was called to order at 11.30 A. M. by the president, Hon. James English, of New Haven, Ct. The report of the executive committee was read, and in it a statement was made that some 37 bills adverse to the interests of the electric lighting and railway companies of the State had been presented to the legislature during its last session, but, due to the excellent work of the committee, not one had become a law.

A general discussion then followed on the subject of the proper method of charging for meter service. President English gave a very interesting explanation of the system in vogue with the New Haven Electric Light Company, in which he stated that the customers in that city were given a flat rate, based on the maximum pull on the motor, together with average meter readings. Later the delegates sat down to a well served and sumptuous shore dinner. A number of those present, through the courtesy of W. G. Bushnell, enjoyed a delightful return trip to New Haven on his naptha launch. Among those present were the following:

Alfred E. Hammer, Branford, Ct.; F. F. Fuessenick, Torrington, Ct.; H. J. Hencky, Torrington, Ct; T. F. Hammer, Branford, Ct.; A. O. Shepardson, Waterbury, Ct.; L. P. Giddings, New Milford, Ct.; J. S. Eastwood, Thomaston, Ct.; F. C. Golding, Branford, Ct.; E. F. Peck, Brooklyn, N. Y.; L. C. Whitney, Middletown, Ct.; C. A. Paul, Bridgeport, Ct.; D. W. Clark, Torrington, Ct.; J. W. Barmmer, Norwich, Ct.; A. J. Puritan, Stamford, Ct.; J. Hurlbert, Norwich, Ct.; John Workman, Torrington, Ct.; G. H. Welch, Torrington, Ct.; Geo. E. Cowperthwait, Danbury, Ct.; D. F. Barritt, Rockville, Ct.; Geo. G. Blakeslee, Naugatuck, Ct.; H. L. Mansfield, Middletown, Ct.; G. E. Terry, Waterbury, Ct.; F. L. Terry, New London, Ct.; A. M. Young, Waterbury, Ct.; N. G. Bushnell, New Haven, Ct.; J. English, New Haven, Ct.; A. F. Hunie, New Haven Ct.; G. J. Jackson, New York.

The Interstate Telephone and Electric Company has been incorporated at Dubuque, Iowa, with a capital stock of $100,000. Mr. F. F. Sapp, of Chicago, is president of the company, which will at once commence the construction of a toll-line exchange for the Dubuque Telephone Company.

THE NIAGARA-BUFFALO TRANSMISSION LINE.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, JUNE 9, 1897, BY J. G. WHITE.

(*Continued from page 4, vol. 31.*)

Mr. Seely: Would it be preferable to place the wires underground entirely? It would cost probably, according to your figures, about $800,000 more.

Mr. White: That would be $40 a horse-power?

Mr. Seely: At the rate of $40 a horse-power, yes. Then you have a permanent installation underground. You are not troubled with the defects discovered with the overhead wires.

Mr. White: That view, of course, is possibly correct. But, as I stated in this paper, it has not been demonstrated up to date, from the fact that the only trouble due to the line so far is from a joint in the cable. There is no trouble due to the insulator; and there are 4,000 feet of underground as against over 24 miles of insulators; so that we have about 35 chances to one, as far as distance is concerned, of trouble with the overhead as compared with the underground.

Mr. S. D. Greene: It seems to me, Mr. President, that the question of lightning on the line is really the most serious point to be considered; that is, in considering the comparative advantages of the overhead and the underground lines. It is a fact that no tests which any manufacturing company that I know of can produce at their works are at all indicative of the results to be obtained on the line here; and it has been found actually necessary for them in testing lightning arresters and fuses to bring the experimental apparatus to Niagara Falls and actually test it by short-circuiting the machines here. In other words, the effect of a short circuit with 5,000 horse-power generators on a 10,000-volt line is very different from anything obtained in ordinary use and practice. While it is probable that the lightning protection that has now been devised in the line will be sufficient to answer the purpose for the present, yet there will always be more or less risk from lightning until the wire is put underground. It seems to me that that is the evident conclusion that one must arrive at; that that is the weak point in the whole system at this time, and must be until those wires are put underground finally.

Samuel Insull: Did I understand Mr. White to say it would cost $600,000 more for a line to carry 20,000 horse-power underground?

Mr. White: It would cost about $1,250,000, I estimate, for a line carrying 20,000 horse-power; that is, four series, three wires each, making 12 wires total, for a distance of 27 miles, cost fully $1,250,000, with the lead-covered cable, of which four-fifths would be for lead-covered cable, and one-fifth for conduit. That would mean $60 per horse-power, in other words, and overhead about one-third of that amount, or $20 a horse-power.

Mr. Insull: Then the interest on it would form an important part of the cost.

Mr. White: If placed underground at $60, the interest charge, of course, would be three dollars, allowing five per cent; and at least an additional amount equal to that would be allowed for depreciation, and probably a good deal more than that. It is hard to tell what the depreciation would be on lead-covered line under those circumstances. But five per cent would certainly be moderate; probably 10 would be more nearly correct. In that case the depreciation would be $6 per horse-power, and interest three, making 10 per cent, to be safe.

Mr. Insull: That would be a very important proportion. If you were going to sell power at $20, it would be 33 per cent of the gross receipts. On this question of lightning arresters, I would like to ask Mr. Greene whether it is not true that, in units up to 1,000 horse-power, lightning arresters can be furnished which will carry a lightning discharge, and, at the same time, will interrupt short circuit of the dynamos without serious trouble? Of course, as he says, with 5,000 horse-power it is a very serious matter to stop an arc after it has once formed, but up to 1,000 horse-power it can be done more easily, and is probably possible.

Mr. Greene: I think it may be possible, but I do not think any company will guarantee a device which will be an absolute protection against lightning, and, as the amount of power delivered in Buffalo increases, it seems to me that the success of the sale of the power in Buffalo is going to depend very largely upon the absolute reliability of the service. It is possible, for instance, that the poles themselves might be struck and destroyed by lightning, might cause very serious danger to the line. Of course, the network which Mr. White describes as having been placed on the top of the poles is a good protection. I do not think it can be said that it is an absolute protection against lightning under all conditions of stroke.

Mr. Insull: When I first saw this overhead line, what seemed to impress me particularly was the awful responsibility of running such high potential above ground. But the figures just given by Mr. White would seem to indicate that if the line were put underground it would render transmission from here to Buffalo almost prohibitive. With triple, compound-condensing engines, the cost, including real estate, installing, say, 20,000 horse-power, would be certainly within $2,000,000—$100 a horse-power. Now, if to convey the same amount of power it is going to cost $60 per horse-power for the underground system, if they ultimately have to go to underground work, it would seem to show that the cost of the installation here at the source of power, and the cost of the conveying part of the plant would be so great as to render long-distance distribution, even at so short a distance from Niagara as Buffalo is, almost prohibitive. I do not imagine from looking at the plant here that it can be installed for much less than $100 a horse-power. It would seem to me, therefore, that a long-distance power transmission plant, including the underground conductors, would cost at least 60 per cent more than the steam plant to produce the best possible results from steam in the city of Buffalo.

Mr. Beggs: I think the paper that has been read by Mr. White, and the discussion that has followed since, should be very satisfactory to investors in local electric lighting plants, who for a few years have heard that their business was likely to be taken away from them by these long-distance transmission plants of very high potential. I heartily agree with the idea that has been suggested by Mr. Insull, and I very seriously question whether even this great plant at Niagara Falls can compete with the modern steam plant 50 miles from Niagara Falls. I do not believe it possible; and yet it is hard for us even to imagine what the future developments of this long-distance transmission has in store. I have been called in by some friends within the last 30 days to look over a proposition to transmit 60,000 volts a distance of 60 miles, and to transmit 40,000 horse-power, the initial installation being 4,000 horse-power, on a No. 4 wire; and that is held out as a proposition to carry this current and supplant the entire steam plant in a city of some 60,000 inhabitants. The only satisfaction of the electric lighting plant and the electric railway plant in that city, where it is proposed to deliver this power, is that it is proposed to do it at about two-thirds of what it is now costing them to produce it. I think if they can realize that result, why they had better take that end of it without attempting to install the transmission plant themselves. I have had others of the same kind. But the point I want to make is that I do not think that those of us who are interested in central stations that may be menaced, as some of us have been, by these long-distance transmission plants—I do not believe that we are in any serious danger.

Mr. White: On this question just spoken of by Mr. Beggs, it is almost certain that the localities are very few and the circumstances must be very exceptional which will support a transmission line 50 miles long. In the first place, it would be almost necessary to have an ideal water-power, unusually good water-power, and, in the second place, a very high cost of fuel, or the power could be generated more cheaply by steam. But there are localities where plants of that kind can pay and can earn not only fair, but, in some instances, an extremely high, interest on the cost, even for such long distance. The only part of this country, perhaps, where that would apply would be out in the Rocky Mountains, where in some regions wood is scarce and coal costs perhaps $11 a ton. In such localities the cost of maintaining the interest on a line even 50 miles long can well be afforded. But, under ordinary circumstances, as Mr. Beggs states, with a triple, condensing, compound steam plant, power could probably be generated far more economically than it could be developed and carried 50 miles overhead, and certainly decidedly more cheaply than it could be carried 50 miles underground. In this line, taking Mr. Insull's suggestion as to the interest charge, it would certainly not be wise to entail a charge of perhaps $10 per horse-power for depreciation and interest underground, as against $2 per horse-power for depreciation and interest overhead, unless the former was absolutely necessary and it was found by experience that lightning occasioned such trouble that it could not be handled satisfactorily. I do not believe that is the case. As to the insulation, it is possible to have that satisfactorily arranged. I know a plant in Michigan that I had a report from two or three weeks ago that has been going all Winter, and in a climate where there is a great deal of rain and snow, and they have had quite a severe Winter, at least in the way of a good many storms. That plant has been shut down in four months but once, and that was on Sunday noon, when notice had been given to the customers the day before that there would be a shut-down at noon the next day. The shut-down was for 10 minutes, and it was to tighten the key on the water-wheel shaft. The plant has no duplicates, has only one generator, and no duplicate machinery of any kind; and the only shut-down in four months was this one of 10 minutes on Sunday noon to tighten the key in that shaft. So that it is possible to run a plant satisfactorily and not have any trouble with it.

Mr. Steinmetz: I think it is dangerous to generalize too freely in such matters, and to state that it is or is not economical to transmit power 50 miles. It all depends upon what the power is used for as to whether the transmission is economical or not. The problem changes very greatly according to whether the power is used in a factory for 24 hours a day, a steady load, or whether it is used where the whole load is only an hour a day run, and the remainder is idle, and you have to pay the same price. That is, you have to pay for the maximum load continuously, and use it only a very short time. And then there is the other question coming in, as to whether your railway network of the city depends upon continuous power, and you must never shut down under any circumstances, or whether you run into a continuous lighting system; whether you have a big storage battery, and when you send out a man to repair the line the storage battery carries you over the break. All these conditions change the problem very greatly, and you must investigate the individual case to see whether the steam-engine plant is the more economical or the long-distance transmission, but you can not lay down any general rules. (Applause.)

Mr. Scott, of Pittsburgh: The question of lightning arresters is one of vital interest in long-distance lines. A little experience is worth a good deal of theory in this matter. In the plant at Telluride, Colo., which has been in operation for some half dozen years, a great deal of difficulty was experienced during the first year with lightning. The lightning destroyed with a great deal of rapidity all the arresters that at different times were sent there during the first season. The subject was gone into very carefully, and a new form of arresters which were a perfect success for protection were provided, and since that time there has been quite a freedom from difficulty arising from lightning. While it is probable that there can never be absolute security from dangers from lightning, just as there can never be absolute security from breaking of shafts or falling down of poles, yet lightning protection can be accomplished with the same co-efficient of safety, or even more favorable co-efficient of safety, than other parts of the apparatus. The original plant at Telluride was for 3,000 volts, and this has been increased to 10,000. The distribution extends over the mountains, and at some seasons the lightning is quite severe. The plant supplies stations distant from two and one-half to 18 miles, in large number and widely distributed. There has been trouble from lightning. Some transformers were burned out, and careful investigation showed that the ground wire of the lightning arrester had become affected by some workman or some changes taking place. The experience at that plant is such as to justify the statement that 10,000-volt transmission, through a country which is particularly susceptible to lightning disturbances, can be adequately protected.

Mr. White: I was very glad Mr. Steinmetz made his remarks calling attention to the well known fact that any problem of this kind is an engineering problem and deserves solution and attention on its merits irrespective of the general conditions and theories which may apply to other plants and do not apply to that; and I can best illustrate that perhaps by the results of some tests that we had made out at Leadville, Colo. We sent a man out there to make some investigations as to an electric-power plant in that region. He found that in some instances power was costing the miners as high as $2,000 a horse-power for the actual

indicated horse-power used. This was a hoist, of course, in that region; and over in Cripple Creek some investigations were made. A great many miners have hoists, and have their boilers heated and power on for 24 hours in the day, and they perhaps use it but once in 30 minutes, or once an hour, to hoist a load. But they require an engineer, and they require fuel for the whole 24 hours, and fuel there costs $11 or $12 a ton delivered at the mines, and water costs 75 cents a barrel; and with the use of a 10 or 15 horse-power engine but a few minutes each hour you can readily conceive that the figures would run up to a very high degree. And even with plants using a considerable amount of power the cost is usually from $200 to $300 per horse-power indicated. So there are cases where power can be transmitted 50 miles or more and allow a good profit.

Mr. W. M. Lea Walbank, of Montreal: I would like to ask Mr. White if he has ever put up any steel or iron poles; has had any experience with them?

Mr. White: No, we have not for long transmission work. Our experience with iron poles has been on ordinary lighting or street-car work.

Mr. Walbank: In this Buffalo transmission, the poles are all of white cedar, I understood you?

Mr. White: Yes, sir.

Mr. Walbank: We have just constructed a steel pole line from Lachine Rapids into Montreal, and constructed all of our line of steel poles; that is, we took a channel iron and cut it diagonally through, and then riveted the reverse ends so as to make it about eight inches at the top and 20 inches at the bottom; put two of these columns up and then latticed them together. And your wooden cross-arms are almost identically the same as we have, but without any braces underneath; and we have altogether 36 wires on. Our poles are placed 108 feet centers, and they stand probably 30 feet high, including seven feet in the ground. They are bedded seven feet in concrete.

Mr. White: That ought to give very good construction.

Mr. Walbank: The way we tested the poles, we placed 200 pounds of pig iron on the top, with a fulcrum to take the place of the ground. Our pole line, complete with wire, insulators, cross-arms and everything, will cost us for a distance of 30,000 feet, for the complete line, about $92,000. We figured that, for underground work, it was going to cost over $300,000 to do the same thing with lead cable. We have not tested it practically yet, because it is just about completed now.

The President: I will have to close this discussion now. It is very interesting, and I wish we had more time at our disposal.

We have another very interesting paper, and I shall call upon the author presently. I am sure we are all very much indebted to Mr. White for the instructive paper that he prepared. I know, personally, that he put himself to a great deal of trouble in the preparation of this paper for the benefit of our members, and I feel that he must, more or less, feel repaid by the appreciation that has been shown and the knowledge on a number of very important points that it has elicited.

Mr. Ferguson, of Chicago: Mr. President, I move that a vote of thanks of the association be tendered to Mr. White for his very interesting and able paper.

Mr. Seely: I second the motion.

The President: It is moved that a vote of thanks be tendered to Mr. White for his instructive paper. Is it your pleasure that that motion carry? Carried.

Ploughing by Electricity.

From time to time during the last 10 years and more we have heard rumors of steam and horses being supplanted in ploughing by electricity, but the affairs have usually been only experimental and have led to no permanent results. Lately, however, the system has been worked out in Germany on a commercial basis, and we are now able to lay before our readers, says London *Engineering*, illustrations of machines constructed by Mr. A. Borsig, of Berlin, and now being used in many localities. Electric ploughing tackle is best adapted to meet the requirement of the great beet-root estates in Germany, which are devoted to the manufacture of sugar, for they are of large extent and have command of capital to enable them to adopt all labor-saving appliances. Further, there are on such estates large installations of steam power which lie idle a great part of the year, including that period at which ploughing is done. Hence, by the addition of dynamos and of a system of overhead conductors in the fields, it is possible, at small cost, to adopt electric ploughing over a large area.

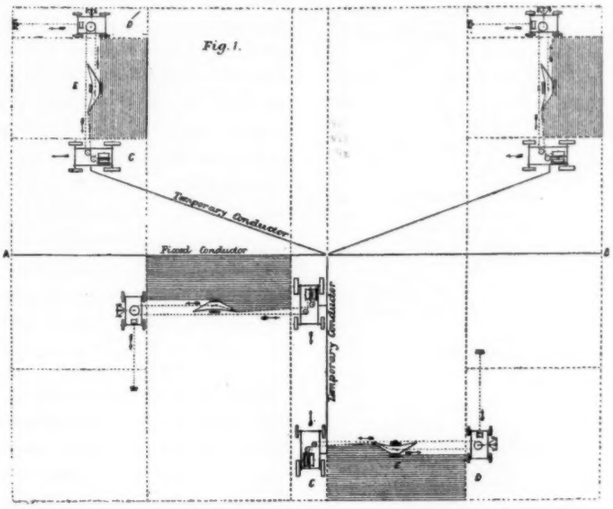

FIG. 1.—DIAGRAM OF EIGHT FIELDS EQUIPPED FOR ELECTRIC PLOUGHING.

The overhead conductors do not extend into all the fields, but are tapped by temporary wires laid on the ground, as required. Fig. 1 shows eight fields, with four sets of tackle at work, all drawing current by temporary connection with the overhead wire A. B. Each set of tackle comprises a "motor wagon" C, an "anchor wagon" D, and a plough E, which is drawn backwards and forwards between the other two, cutting five furrows, as shown by the parallel lines. On the motor wagons is fixed a 40-horse-power alternate-current motor, with the necessary switches and driving gear both for the hauling and traveling, while the anchor wagon carries the anchor and a sheave round which the hauling cable runs. It is possible, with an electric conductor of 500 metres—1,640 feet—and a ploughing rope of 300 metres—985 feet—working length, to plough 222 acres from one center of operations.

The motor wagon, Fig. 2, carries two drums on horizontal axes. On these the two ends of the rope are wound, the bight passing round the sheave on the anchor wagon. One drum is driven to draw in the rope, while the other runs under a brake to keep the tail rope fairly taut. The two parts of the rope are led round guiding sheaves, revolving in horizontal planes under the wagon. The two rear wheels can be connected to the motor by clutches and gearing to propel the wagon, while the two leading wheels serve to steer it. On the opposite side of the wagon to that shown in the view there is a platform for the attendant, with the various handles and levers grouped in front of it. The weight of a motor wagon is seven tons. Mr. Borsig states that, with fixed steam engines of 250 horse-power and with five ploughs, 6,000 acres of medium heavy ground can be ploughed to a depth of 14 inches, at a cost of 3*s* 10*d* per acre. If separate engines have to be employed, the cost per acre is increased by 7*d* per acre.

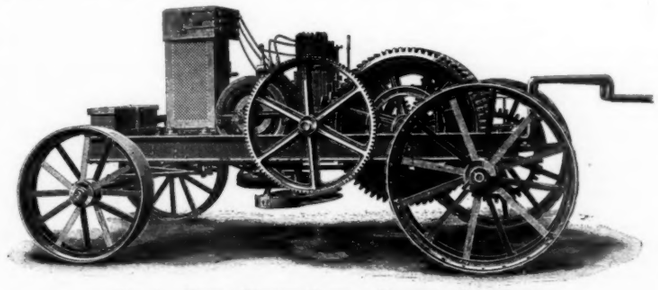

FIG. 2.—MOTOR WAGON USED IN ELECTRIC PLOUGHING.

The anchor wagon carries a sheave round which the ploughing rope runs. The sheave is fixed in a guide, and is connected by a chain to the anchor. Hence, as the anchor sinks into the earth under the pull of the rope, the sheave and it move together. The anchor itself has four prongs, and is hung from a light crane, or derrick, by which it can be completely raised for traveling if the jib be wound up by the worm hoist at the opposite side of the frame. At other times it is manipulated by the chains running round the pulleys at the head of the jib. The slack end of the ploughing rope, when the plough is moving towards the motor wagon, actuates gearing which winds the anchor out of the ground and moves the anchor wagon forward into the right position for the next double set of furrows. At the same time, the anchor and sheave are moved backwards, relatively, to the frame to allow for the slip of the anchor in the earth. The anchor is then dropped by the attendant, and the next set of furrows cut. The strain of the rope goes direct from the pulley to the anchor, and not through the wagon frame.

American Electric Heating Corporation.

At the annual meeting of the American Electric Heating Corporation, held in Boston last week, the directors were re-elected. No other business was transacted. The board of directors now stands as follows: J. Murray Forbes, president; Edward C. Perkins, Charles Francis Adams, 2d; Arthur B. Smith, Ambrose Eastman, Arthur M. Dodge, Charles A. Morse, Jr., Charles I. Edgar, Everett Morse, George U. Crocker, S. S. Wheeler, and H. B. Scott.

A Boston dispatch states that there is but little probability that the contemplated reorganization of this company will be attempted before next Winter. The dull state of trade has naturally affected the company's sales of heating apparatus, but notwithstanding this the company's officials are well pleased with the progress that has been made under General Manager Ayer's efficient management in the introduction of the company's goods.

Electric Light Wires and Shade Trees.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you, or some of your subscribers who know of the effect of electric light wires on shade trees, tell me whether they are injured by the wires or not? I have understood the trees in some streets in Cleveland, Ohio, have been killed. We have the wires on the trees in the street I live on, and I am anxious to know about it. I have never seen the subject discussed in any of the papers.

Yours truly,
W. W. TREVOR.

Lockport, N. Y., June 24.

OBITUARY.

John Graham died at his residence at Sea Cliff, Long Island, on July 5, after a brief illness. Until a few years ago he lived in New York city, but upon retiring from business removed to Sea Cliff. At the time of his death he was treasurer of the Franklin Electric Light and Power Company, of Glen Cove, Long Island.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JULY 14, 1897.

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A 40-ton flywheel on a Corliss engine in the power-house of the Tacoma, Wash., Street Railroad Company burst on July 11. Half the building was demolished and several persons were slightly hurt. A break in the governor rendered it useless and the engine ran away. The loss is $20,000, and 30 miles of street railway were tied up. The importance of a good and thoroughly reliable governor, as an essential part of a steam engine, has again been emphasized in a forcible and expensive manner.

An index to Volume XXX is mailed to each subscriber with this issue of the ELECTRICAL REVIEW. Any one failing to receive the index should promptly notify this office.

Under the title of "A Complicated Legal Question," Dr. Harold N. Moyer, of Chicago, discusses in this issue of the ELECTRICAL REVIEW a damage case which should be of interest to all electric railway men.

Several of the New York daily papers have recently announced that a number of the finest and largest new buildings in the city have been erected without provision for gas pipes, depending entirely upon their isolated electric plants for light. This is not news to the electrical fraternity, but at the same time it is encouraging to have it recognized, even at this late day, by the lay press.

Now that the horseless vehicle is an established fact, accounts of runaway motocycles are in order, the first instance occurring the other day in Chicago, when some ignorant or malicious individual turned the switch of a motocyle which had been duly "stabled" for the night. The vehicle of course started, ran the length of the barn until it struck a brick wall, smashed the dashboard and front wheels, and the driving gear becoming in some manner disengaged from the motor, the latter revolved unchecked until the batteries were completely exhausted. A switch, protected by a lock and key, is now placed between the battery and motor terminals.

The thanks of the traveling public are due to President Johnson, of the Nassau Electric Railway Company, in Brooklyn, N. Y., for his prompt treatment of a disorderly passenger. The man had been acting in a disorderly manner on a trolley car returning from Coney Island, and beside using objectionable language, assaulted the conductor of the car. President Johnson happened to be at the Twenty-third street depot of the company, and, when notified of the trouble, promptly hauled the obstreperous passenger from the car and handed him over to a policeman. In the police court he was found guilty and fined $20. A few exemplary cases of this kind carried to the limit of the law by the officers of electric railway companies would have a salutary effect in cleaning out an unruly class of passengers who seem to consider that the payment of five cents includes the privilege of a display of their rowdy character. There is nothing so annoying to decent electric-railway passengers as the loud-mouthed conversation of people of this class.

JINRIKISHAS.

Handsome parks, containing various forms of amusement, combined with scenic effects, often of great beauty, are now controlled by many electric-railway companies. These "boomers of traffic" have proved to be very profitable to the railway management, on the average. The amusements provided are almost universally of a high character and refined order. But the traveler discovers a sameness about them, especially in those parks controlled by the street-railway companies of our larger cities. Here is a suggestion for the managers of these enterprises, which emanates from a man who has been about the world somewhat:

In a number of the street-railway resorts are stretches of excellent walks and roadways, often miles in extent. What could be pleasanter than to make the tour of the park pathways in a genuine jinrikisha, hauled by a genuine Japanese? The investment required to install such equipages might be considerable, but we predict it would be a good one. The contrast between riding to the park in a trolley car at 30 miles an hour and riding about the park in a 'rikisha at four miles an hour would be effective, to say the least. Old people, who get tired walking about, would appreciate such a convenience. The experiment seems to us to be worth trying.

It has become evident of late that opportunities for increasing the export trade of electrical apparatus are very encouraging. A financial journal states that the exportation of electrical machinery, materials and appliances is to-day as heavy as any other class of manufactured articles shipped from the port of New York. There is hardly a steamer leaving New York that has not on board shipments of electrical goods. These export shipments are difficult to trace, for the reason that electrical appliances are often classified with other kinds of machinery and hardware on the ship's manifest. The export trade in telephone apparatus during June seems to have been unusually heavy. It is stated that two exporters shipped upwards of $25,000 worth of goods, and there are at the present time further inquiries in the market for telephone lines in Central America.

The death of Mr. Henry B. Stone, until recently president of the Chicago Telephone Company, was an unusually sad and sudden one and comes as a great shock to his many friends in the telephone fraternity. He was a cultured and popular gentleman.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

PROGRAMME OF FOURTEENTH GENERAL MEETING.

The fourteenth general meeting of the Institute will be held at Greenacre-on-the-Piscataqua, Eliot, Me., on July 26, 27 and 28. The opening session will be held at 2 P. M., on Monday, July 26. The following papers will be presented:

1. "The Precision of Electrical Engineering." Inaugural address, by the president, Dr. Francis B. Crocker, of New York city.
2. "The Alternating Current Induction Motor," by Charles Proteus Steinmetz, of Schenectady, N. Y.
3. "A New Form of Induction Coil," by Prof. Elihu Thomson, of Lynn, Mass.
4. "Effect of Heat Upon Insulating Material," by Putnam A. Bates and Walter C. Barnes, of New York city.
5. "The Effect of Armature Inductance Upon the Electro-motive Force Curves of an Alternator," by Prof. W. E. Goldsborough, of Lafayette, Ind.
6. "Electric Metering from the Station Standpoint," by Caryl D. Haskins, of Boston, Mass.
7. "Development of the Fire-Alarm Telegraph," by Adam Bosch, of Newark, N. J.
8. "Electrical Traction. — Notes on the Application of Electrical Motive Power to Railway Service, with illustrations from the Practice of the Metropolitan Elevated Road, of Chicago," by M. H. Gerry, Jr., of Chicago.
9. "The Cost of Steam Power," by Horatio A. Foster, of Buffalo, N. Y.
10. "Efficiency and Life of Carbons in Enclosed Arc Lamps," by W. H. Freedman, of New York city.
11. "Armature Reactions in a Rotary Transformer," by Prof. Robert B. Owens, of Lincoln, Neb.
12. "Recent Applications of Storage Batteries to Electric Railways," by Herbert Lloyd, of Philadelphia.
13. "The Economy and Utility of Electrical Cooking Apparatus," by Prof. J. P. Jackson, of State College, Pa.

Greenacre, the location selected by the executive committee for the fourteenth general meeting, is a quiet summer resort in the town of Eliot, Me., and is beautifully situated on the Piscataqua River, about four miles above Portsmouth, N. H. There are facilities for boating and bathing. If the weather is favorable the roads will be fair for bicycling. Greenacre may be most conveniently reached by steam launch, leaving Portsmouth at 11:25 A. M., shortly after arrival of the 9 A. M. express from Boston, on the Boston & Maine Railroad. Single fare from Boston, $1.60. Excursion by launch, 40 cents. No special arrangements for transportation have been made, but members are requested to specify the route by which they will reach Boston.

A less direct route, but one which offers the attraction of a short sea voyage, is that of the Maine Steamship Company, whose steamers leave New York for Portland every week-day at 5 P. M.

Members will be provided with rooms at cottages on the grounds, or dwellings in the vicinity; or if they prefer, may secure tents in the Sunset Camp. Price $1.50 per day, or $8 per week, with meals at the Greenacre Inn.

Members may also secure rooms upon application to the secretary, at the Rockingham, Portsmouth, N. H., $4 per day, or the Wentworth at New Castle, N. H., $4.50 per day, American plan. Either of these hotels is accessible by steam launch from Greenacre. Ladies may be invited to the meeting.

Booklets, giving further information, will be mailed by the secretary upon application to those who wish to learn additional details before perfecting their plans.

The sessions will be held at Eirenion Hall on the grounds. There will be a reception Tuesday evening, July 27, evening dress optional. On Thursday, the 29th, there will be an excursion to the Isles of Shoals.

THE LATEST NEWS.

Highway robbers held up two trolley cars in different parts of Chicago on July 9, and a third on July 11.

An electric railway is proposed between Southbridge, Mass., and Charlton Depot, a distance of eight miles. Chas. D. Harrington, of Southbridge, is interested in the project.

Since Mr. M. M. Hayden assumed the management of the Globe Carbon Company, at Ravenna, Ohio, about three months ago, the plant has been thoroughly overhauled. New machinery has been installed, the details of the business have been refined, and all the different departments are working smoothly together. The company is in first-class shape to handle its trade.

The Pittsburgh, Allegheny & Manchester Traction Company, of Pittsburgh, Pa., has become a part of the United Traction Company, in which Brown Brothers, of Baltimore, are largely interested. Sixty thousand shares of Pittsburgh, Allegheny & Manchester stock have been transferred. The stockholders received $25 a share on series A bonds and $16 per share in other bonds, to be redeemed later.

H. M. Underwood & Company, Chicago, who, a week ago, were put to considerable inconvenience by a fire in their lamp guard factory, destroying some 200 gross of Duplex guards ready for shipment, have already arranged for a new and larger factory, fully equipped with the latest machinery, and of a capacity to turn out at least 100 gross of guards a day. The factory will be in full operation by the 20th instant.

The Newburg, N. Y., Electric Railway Company was incorporated on July 9 as a result of the consolidation of the Waldon & Orange Lake and the Newburg & Orange Lake Railroad companies with the present Newburg Electric Railway Company. The capital is $150,000 and the directors are Benjamin Norton, of New York city; Silas B. Dutcher, William H. Pouch, Alfred J. Pouch, Frederick J. Pouch, Alden S. Swan, William M. Tobias and S. S. Whitehouse, of Brooklyn, and Charles N. Finch, of Summit, N. J.

Death of Henry B. Stone.

Henry B. Stone, of Chicago, formerly vice president and general manager of the Chicago, Burlington & Quincy Railroad and until two weeks ago president of the Chicago Telephone Company, was instantly killed on July 5 by an explosion of fireworks at his summer home in Nonquit, near New Bedford, Mass.

Mr. Stone was entertaining a party of friends with a display of day fireworks. The principal piece was a mine, which was so devised as to scatter, when exploded, a number of vari-colored tissue-paper animals and make them fly through the air. The spark on the fuse appearing to have gone out, Mr. Stone picked up the piece to relight it. While holding it close to his face it exploded. The concussion caused instant death. The skull was fractured and the face and body mutilated by the explosion. Mrs. Stone and her two sons and two

HENRY B. STONE.

daughters witnessed the terrible accident.

Henry B. Stone was born in New Bedford, Mass., in 1852, and was a graduate of Harvard University. Soon after leaving college he entered the employ of the Waltham Watch Company, leaving there at the end of six or seven years as an expert machinist. He then went into the shops of the Chicago, Burlington & Quincy Railroad at Aurora, and rapidly worked his way upward, giving early evidence of great executive ability. The first higher appointment he received was to the position of superintendent of motive power. In 1881 he was made general superintendent, and two years later became assistant general manager. In 1887 he was promoted to be general manager of the Burlington system, and in 1889 the further office of second vice-president was given to him. Mr. Stone was almost at once called upon to face the great strike of the Brotherhood of Locomotive Engineers. After a year's struggle the road won the strike and Mr. Stone became very widely known through his handling of the affair.

Soon after the settlement of the strike, which had told upon his constitution, Mr. Stone resigned his position with the Chicago, Burlington & Quincy and went abroad. On his return he was elected president of the Chicago Telephone Company, of the Central Union Telephone Company and of the Bell Telephone Company of Missouri, thus representing the great interests of the American Bell Telephone Company in the Central States. He resigned the presidency of the companies but a few weeks ago, in order to carry out plans of a much wider nature which he had formed. His resignation took effect July 1, as reported in last week's ELECTRICAL REVIEW. At the time of the World's Fair Mr. Stone was chairman of the committee on grounds and buildings, and to him is credited much of the architectural success of the exposition.

Mr. Stone left Chicago on June 30 for St. Louis, where he attended a meeting of the Bell telephone directors. From there he went to his summer home in Nonquit. He had intended to sail for Europe with his family the first of August. Mrs. Stone, to whom he was married in his birthplace, New Bedford, survives him, as do two sons and two daughters —Alice, aged 18; Henry, 14; Edward, seven, and Margaret, four. Among other relatives are two well known in railroad circles, J. W. Forbes, long chairman of the executive board of the Chicago, Burlington & Quincy, and C. E. Perkins, the present president of the road.

Cyrus Field's Cable Relics.

It was announced last week that the National Museum, at Washington, D. C., had secured the famous Cyrus W. Field collection of documents, autographs, telegrams and cablegrams relating to the first Atlantic cable. It has been donated by Mrs. Isabella Field Judson, of Dobbs Ferry, N. Y., and is being arranged for exhibition by Professor Maynard. The journal kept by Mr. Field, and the notes of deep-sea soundings made by him and the officers of the "Great Eastern," are part of the collection. Mr. Field's private library forms another part of it. There are also copies of medals presented him by Congress and the French Government, engraved resolutions passed by members of bodies in this country and Europe, a cane made from the wood of the "Great Eastern," cases containing sections of the first cable, and those evolved from it, and the globe used by Mr. Field while working out his plans.

PERSONAL.

Mr. Jacob Cloos, of Milwaukee, manufacturer of the Cloos patent junction box, ran down to Chicago last week to look after the details of some large contracts recently closed by the Chicago agents for this useful and necessary adjunct to high-tension underground work.

It is understood that a contract, to date from August 17, 1897, has been signed by Messrs. R. T. McDonald and J. J. Wood, under which the latter is to remain in the employ of the Fort Wayne Electric Corporation for a period of 10 years, and that the corporation shall use his patents during that time.

The many friends of Mr. Louis A. Ferguson, of the Chicago Edison Company, will be pained to hear that he has been suffering from an attack of appendicitis since the early part of last week. Owing to prompt action on the part of his physicians an operation was not necessary and Mr. Ferguson's speedy recovery is assured.

ELECTRICITY DISPLACES STEAM.

FIRST STEAM ROAD IN OR AROUND CHICAGO TO USE ELECTRIC MOTORS.

A part of the Suburban Railroad, which runs through the towns of Cicero, Riverside, La Grange and other western suburbs of Chicago, was operated by electricity for the first time on June 26 last, electric trains running between the West Forty-eighth street terminus of the Metropolitan "L" and La Grange, and within probably 30 days steam locomotives will be banished and passenger coaches will come into the business center of Chicago over the Metropolitan elevated tracks. When all in operation, some 51 miles of track will be traversed by what Oliver Wendell Holmes called the "broomstick train."

This is the first time electricity has been installed on a steam railroad in or around Chicago. The Suburban Railroad is and is not a street railway, for it is intended to run trains 30 miles an hour, carry express and freight, and in short transact all the business common to steam roads. At the same time it is a street railway, because some of its cars will stop at street intersections. The express trains, however, will stop only at important points, such as Austin, Oak Park, River Forest, Riverside, etc.

The work of equipping for electricity the entire roadway is practically completed and, as soon as the incline at the Forty-eighth street terminal of the Metropolitan is completed, the steam locomotives will have to give way to the electric motors. The company is operating by steam 22 miles of track, the larger portion of which it leases from the Chicago & Northern Pacific, the old Harlem division of that road.

Of this mileage 2.25 miles will be operated jointly by steam and electricity when the electrical equipment is fully installed. Thirty-two and a quarter miles include a part of the main line of the Chicago & Northern Pacific and a section of the Wisconsin Central road, by which the Suburban reaches River Forest, Thatcher Park and the Central picnic grounds on the Des Plaines River, between Division street and North avenue.

The balance of the 20 miles will be operated in a short time exclusively by electricity. In addition to the leased line, the Suburban road is building 31 miles of new track on streets and over private right of way through the towns of Cicero, Riverside and La Grange.

Of the new work, the track is laid from Forty-eighth street in Harrison street to Riverside and La Grange, and the balance of the work will be completed in about 10 days. Then the Suburban road will be able to compete with the Chicago, Burlington & Quincy, the Chicago & Northwestern and the Cicero & Proviso street-car line, tapping a territory with a population estimated at 200,000.

The power-house is located at the corner of West Twenty-second street and Harlem avenue. In it are two tandem, compound, condensing engines, the large one of 560 horse-power and the smaller one of 240 horse-power. The large one is coupled direct to a direct-current dynamo of 400 kilowatts capacity, the other to a dynamo of 250 kilowatts. The battery of water-tube boilers aggregates 750 horse-power. Back of the power-house is a reservoir, 100 feet wide and 200 feet long, having a capacity of 1,350,000 gallons of water, which is supplied by an air-lift from an eight-inch drive-well 185 feet deep. The water stored in this reservoir is capable of furnishing water for the condensers for four to six weeks. A cooling table, which is an artificial cataract 30 feet wide and 180 feet long, cools the water which spills from the condensers.

The motor cars used on the road are double truck; 42 feet 6 inches over all in length, and 32 feet 6-inch body, equipped with two 50-horse-power motors, air-brakes, and two trolley poles, one on each end of the car. The motor cars are vestibuled at each end, and the passenger coaches are like the motor cars, except they are not vestibuled. All seats are placed crosswise, giving each car a seating capacity of 48, and a crowded capacity of over 100.

At present, with its Chicago terminal in the Grand Central passenger station, the Suburban road carries an average of 6,000 people each week day and considerably more on Sundays. A large increase in passenger traffic is expected as soon as the cars can reach the business center over the Metropolitan tracks.

The Cable Must Go In Chicago.

The competition of the electric cars in Indiana and Wentworth avenues, Chicago, has forced the question of changing the State street and Wabash avenue line upon the management of the Chicago City Railway. Last week two delegations of business men in State street south of Thirty-ninth are said to have called at the offices of the railway and urged that the cable cars give way to the trolley. It is claimed that traffic on the State street cars has decreased since the Wentworth avenue electric cars began to run, and that the Cottage Grove avenue cables have also felt the competition of the faster system. The change is expected to bring back to State street a great deal of the traffic and its attending trade. The Chicago City Railway Company is now figuring on the cost of changing the system, which will be in the neighborhood of $1,200,000.

Street Railway Consolidation in Brooklyn.

Rumors are current that plans are being considered in Brooklyn, N. Y., for the consolidation of the Rapid Transit Company, which controls the Brooklyn Heights Railroad and the Queens County and Suburban Railroad; the Brooklyn City & Newtown Railroad, better known as the De Kalb Avenue Road; the Coney Island & Brooklyn, and the Kings County Elevated Railroad.

TELEPHONE NEWS AND COMMENT.

The New York & New Jersey Telephone Company has declared a quarterly dividend of one and one-half per cent, payable July 15.

The Drawbaugh Telephone and Telegraph Company, in a letter to the Philadelphia councils, declines to do business in Philadelphia under the conditions imposed by the city authorities.

The New York & Pennsylvania Telephone and Telegraph Company has declared the usual quarterly dividend of one and one-half per cent, payable July 15, to stock of record July 5.

President John E. Hudson, of the American Bell Telephone Company, came over to New York last week and enjoyed a short yachting trip as the guest of General Manager E. J. Hall, of the American Telephone and Telegraph Company.

The Interstate Telephone and Telegraph Company announces that it will open its exchange at Roanoke, Va., within a few days. The exchange is equipped for 400 subscribers and it is reported that the company's list is rapidly approaching that number.

The output of the American Bell Telephone Company for the month ended June 20 was as follows:

	1897.	1896.	1895.
Gross output	17,586	17,575	16,753
Returned	7,998	7,178	7,425
Net output	9,588	10,397	9,328
Since December 20:			
Gross output	111,919	114,094	85,059
Returned	44,606	43,177	39,608
Net output	67,313	70,917	45,451
Total outstanding	841,162	747,453	627,957

The case of the Western Electric Company, of Chicago, against the Mobile, Ala., Home Telephone Company, for alleged infringement of patent on a multiple switchboard, which has been on trial in the United States Circuit Court before Judge Toulmin, has been submitted for a decree.

The court has decided in the case of Simon Sterne, of New York city, against the Metropolitan Telephone and Telegraph Company, by which he seeks to restrain them for replacing a telephone at $150 a year with one at $240 a year, that the telephone officials can be examined as to whether or not they were doing a profitable business at the old rate, and whether the improvements in the new service which they offer justify the advanced price.

The Boston Stock Exchange has listed $3,000,000 capital stock (par $100) of the Central District and Printing Telegraph Company, of Pennsylvania. The total issue is $4,000,000, $1,000,000 remaining in the company's treasury. This is a regular licensee company of the American Bell Telephone Company operating principally at Pittsburgh, Pa., although its territory covers 82 other cities and towns in Pennsylvania, 16 in West Virginia and 20 in Ohio.

A press dispatch from Eau Claire, Wis., quotes Mr. J. E. Keelyn, president of the Western Telephone Construction Company, of Chicago, as saying that steps were being taken to organize immediately a corporation to be called the Wisconsin Telephone Company, capitalized at $200,000. The headquarters will be at Eau Claire, and 5,000 miles of toll lines are to be operated, reaching Minneapolis, Duluth, Marquette, Wausau, Merrill, Madison, La Crosse, and Red Wing. He said also that a company of Eau Claire and Menomonie men would be organized at once to establish a local exchange in Eau Claire.

A meeting of the Advisory Board of the Independent Telephone Association of the United States was held at Columbus, Ohio, on July 7. The members present were: James M. Thomas, Chillicothe, Ohio; William J. Vesey, Fort Wayne; H. D. Critchfield, Mt. Vernon, Ohio; C. R. Savidge, Sunbury, Pa.; J. C. Duncan, Knoxville, Tenn.; S. I. Higgins, Saginaw, Mich.; Hugh Daugherty, Bluffton, Ind.; Thomas R. Marshall, Keithsburg, Ill., and E. L. Muller, Frederick, Md. The meeting was called to devise a plan of defensive action against the American Bell Telephone Company.

Power Transmission in California.

A contract for the transmission of power of the river running through the Santa Ana cañon to Los Angeles and Pasadena, a distance of 80 miles, has been concluded between the Southern California Power Company and the General Electric Company. The amount of power to be transmitted at first is 4,000 horse-power. The station will be located in the Santa Ana cañon, 12 miles from Redlands and about 80 miles from the towns in which the electric power will be utilized.

The water will be taken from the river through canal, flume and tunnel along the side of the cañon. Here it will be led into a pipe-line 2,200 feet long, giving what will be equivalent to a vertical fall in the water of 750 feet.

The wheels will be of the impact type, directly connected to the generators, of which there will be four, each of 750 kilowatt—1,000 horse-power—capacity. The maximum line potential will be 33,000 volts, to which potential the initial voltage will be raised by 12 250-kilowatt step-up transformers.

This transmission will be the longest commercial electrical power transmission as yet undertaken, as well as that using the highest voltage. At present, the longest is that transmitting the power of the waters of the Ogden cañon, in Utah, to Salt Lake City, a distance of 36 miles. The Los Angeles transmission will be over twice that distance, and three times the longest distance yet tried with the power of Niagara, which, to date, has only been transmitted to Buffalo, a distance of 26 miles.

The Power Plant of the Pioneer Electric Power Company of Ogden, Utah.

In the cañon of the Ogden River, near the city of Ogden, Utah, the latest and most important hydraulic-power plant of that State, and one of the largest works of the kind yet undertaken in this country, has been carried out during the past year by the Pioneer Electric Power Company of Utah.

The city of Ogden is situated in the basin of the Great Salt Lake, at an elevation of 4,300 feet above sea-level, about 13 miles east of that body of water, and 35 miles north of Salt Lake City. The city extends eastward to the base of the Wahsatch Mountains, which tower 5,000 feet higher, reaching a total altitude of fully 9,000 feet above sea-level. This chain of mountains is intersected by numerous deep valleys or cañons, forming the outlet for drainage areas of considerable extent. The outlet of the cañon of the Ogden River is east of Ogden and distant about two miles from the business center. It is a narrow, winding gorge, walled in by high and precipitous mountains, nowhere more than a few hundred feet in width at the bottom, while at some points it is so narrow that the construction of the excellent macadamized road that traverses it involved considerable rock excavation. At a point about six miles above its mouth the narrow gorge through which the river flows widens out into a valley, some eight miles long and four miles wide, surrounded by an almost continuous mountain chain. This valley is traversed by three streams which unite at the upper end of the cañon to form the Ogden River.

The average annual rainfall in Ogden is 14 inches. In the Ogden Valley it is probably twice as great. The drainage area is about 360 square miles. The flow of the river varies greatly in different years and at different seasons. In May and June, when the snow on the mountains melts, a maximum flow of 4,800 cubic feet per second has been measured, while a minimum of 80 cubic feet in August and September is also on record. The minimum in average years is fully 125 cubic feet per second. The slope of the stream in the upper valley is comparatively gradual, while in the six miles of the cañon there is a total fall of nearly 500 feet. This portion of the river has long appeared an attractive field for the development of power, but apart from a small sawmill near its mouth, there have been only abortive attempts made at utilizing the fall of the stream.

The plans of the Pioneer Electric Power Company contemplate the utilization of the waters of the entire Ogden River water-shed above the mouth of the cañon for the development of power as well as for irrigation. The central features of the plant are: A large storage reservoir and a masonry dam at the upper end of the cañon; a pipe conduit six feet in diameter, a power-house, with water-wheels and electric generators, electric transmission lines and substations for distributing the power to different points, and an extended system of irrigation canals.

The storage reservoir will cover an area of about 2,000 acres, and will have a capacity of nearly 15,000,000,000 gallons. It will be formed by building across the cañon, a short distance below its upper end, a dam of concrete masonry built up of isolated piers and arches founded on bedrock. The length of the dam on its crest will be about 400 feet. It will have a total height of 100 feet, 60 feet of which will be above the level of the present river bed. The up-stream race is protected by a steel-plate covering to prevent abrasion and percolation.

A nine-foot tunnel, excavated through the solid rock around the south abutment of the dam, forms the outlet for the water of the reservoir. At its upper end it connects to a masonry inlet tower, which is, in turn, connected by a riveted steel pipe, eight feet six inches in diameter, with the main gate-house 100 feet below the tunnel. This contains two 72-inch valves, one controlling the supply of the main conduit, the other discharging the surplus water.

The main conduit is a pipe line six feet in internal diameter. Its total length is 31,600 feet, of which 27,000 feet is wooden stave pipe, and 4,600 feet, at the lower end, riveted steel pipe. It is laid in a trench eight and one-half feet wide and covered with earth to a depth of three feet on top. The selection of smooth wooden stave pipe in lieu of steel pipe throughout was made on account of the greater cheapness of the former, as well as its less internal resistance to the flow. The pipe is laid along the side of the cañon and follows the mountains to a point about half a mile beyond the mouth of the cañon. It is built to conform to a hydraulic grade line of two feet per 1,000, a slope believed to correspond to the friction in the pipe. At the upper end of the pipe the inlet is funnel-shaped, and the wooden pipe is continuous except at three points where two riveted steel elbows and a short length of tunnel are substituted. There are eight tunnels in the rock, the longest being 667 feet. There are also eight steel bridges with a total length of 560 feet, besides a timber trestle. The maximum hydrostatic head in the wooden pipe is 117 feet, giving a pressure of 50 pounds per square inch.

FIG. 1.—PIONEER ELECTRIC POWER COMPANY.—TRENCH IN OGDEN CAÑON.

FIG. 2.—PIONEER ELECTRIC POWER COMPANY. MAKING THE WOODEN PIPE.

FIG. 3.—PIONEER ELECTRIC POWER COMPANY. PIPE ALONG THE SIDE OF THE CAÑON.

From the end of the wooden pipe the steel conduit runs to the power-house. The slope of this is quite steep, and the pressure is from 50 to 200 pounds per square inch. It is 60 feet in diameter until it reaches a point 100 feet from the power-house, where it divides into two branches, 64 inches in diameter, which lead to two receivers, one on each side of the power-house. There are 13 elbows in this pipe, and its entire weight is over 2,500,000 pounds. The total efficient head from the flow line of the reservoir, when it is full to the center of the receiver, is 446 feet.

All the steel-pipe sections were rolled and riveted at Ogden in a shop built and equipped with machinery for that purpose. This was done in order to escape the heavy railroad charges which would have been necessary had the rolled sections been built at the works. The building was equipped with all the machinery necessary for rolling, punching, riveting and calking the pipe sections, and an air compressor by which the riveting and calking machines in the trench were driven. After about July, 15, 1896, when the first plate was punched, the work was carried on night and day, and seven days in the week. The steel pipe, after it had passed the riveting machines, was given a prolonged bath in asphalt.

The riveting of the pipe in the trench was effected by power riveters, operated by compressed air at a pressure of from 50 to 75 pounds; 500 rivets per day of 10 hours were driven by each machine. At the steep grades of the steel-pipe lines it is anchored by means of concrete anchorages built around it, 8 feet by 10 feet in section, and 10 feet long.

The wooden pipe is built up of Douglas fir staves, tongued and grooved, 32 in the circumference; 16, 18 and 20 feet lengths and 2 inches thick. All the staves were planed and dressed in a special mill erected near the mouth of the cañon. The pipe was laid upon sills set in the trench, and was banded with round steel rods five-eighths inch and three-quarters inch in diameter, the latter being used where the pressure exceeds that due to a head of 100 feet; in order to bring the staves to the non-accessible parts of the cañon, a cable way 1,000 feet long, erected on framed towers, was built.

Between the inlet tower at the dam and the power-house there are five large gate valves, beside the smaller blow-off and relief valves. Three are six feet in diameter, the other two 42 inches. The first two of the larger ones weigh about 23,000 pounds each, and are in the gate-house; the third is placed near elbow No. 2 of the steel-pipe line, about 100 feet below its junction with the wooden pipe. Its purpose is to permit the closing of the wooden pipe to keep it full of water even when the steel pipe is empty. The head at this point is about 200 feet. The valve has only a single valve-stem, and is operated by a hydraulic lift, supplied with pressure water from the main pipe above the valve. The total weight of this valve is 52,000 pounds, the heaviest single piece in it weighing about 20,000 pounds. Besides these large valves there are two smaller, each 24 inches in diameter; these are placed between the lower end of the six-foot pipe and the power-house in the 54-inch branches leading to the receivers. These branches are reduced to 42 inches by the use of Venturi meters, thus permitting the use of the smaller valves, which are operated by hand. The pipe is fully provided with air, mud and relief valves. The connection between the main pipe and the branches is made by a breeches casting secured to the steel pipes by cast-steel angle flanges and bolts. To withstand the great longitudinal pressure, a heavy concrete block is built around the casting.

(To be concluded.)

Fleming & Poillon Assign.

Thomas J. Fleming and John E. Poillon, composing the firm of Fleming & Poillon, electrical engineers and contractors, at 39 Cortlandt street, New York city, made an assignment on July 7 to Samuel H. Halstead. The liabilities are $10,000. No estimate of the assets is given.

NIAGARA POWER.

A LECTURE DELIVERED BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE 9, 1897, BY L. B. STILWELL.

(Concluded from page 10.)

Let us consider very briefly some of the limitations to which our various methods of transmitting power are subject. For obvious reasons, transmission by shafts, ropes and belts is effective and efficient only over comparatively moderate distances. A shaft, for instance, even a hollow shaft, if strong, is necessarily heavy. It must be supported and carefully aligned. To effect a change in the direction of transmission, special devices, such as gears and pulleys, must be used. All this means loss of efficiency at every step, and the economical limit is soon reached. In the case of transmission by ropes or cables, also, loss of efficiency results from the necessity of supporting the weight, and sharp turns are difficult to make and imply heavy losses. Subdivision by shafts or cables can be mechanically effected only by the interposition of pulleys, gears and similar devices, all of which consume energy, and, therefore, imply waste.

Hydraulic transmission is also limited to comparatively short distances. Under certain conditions, and for distances not exceeding two or three miles, it is used with good results. The municipality of Geneva, Switzerland, under the able direction of Col. Theodore Turrettini, foreign consulting engineer of the Cataract Construction Company, has established a hydraulic plant for the distribution of power throughout that city, which has been splendidly successful and is worthy of most careful study. Colonel Turrettini and the municipality of Geneva, however, recognize the superiority of electric transmission over distances exceeding a very few miles, and they have more recently constructed a second power-plant some four miles further down the Rhone; in this case, using electricity to transmit and distribute the power.

Some of the causes that limit the distance to which power can be economically transmitted by water will readily occur to you. For example, the amount of power transmitted by water through a pipe by water under pressure, is proportional to two things: the quantity of water that flows through the pipe in a given time, and the head or pressure. Friction increases with pressure and also with an increase in the length of the pipe. Then the efficiency of water motors, particularly those of comparatively small output, is low as compared with that of electric motors. Again, the chance of water freezing in the pipes must be considered; and a limitation, not frequently encountered in practice, but still worthy of note, results from the fact that water, unlike electricity, has weight. If we were to undertake to carry a pipe line filled with water over some of the mountain ranges now crossed by electric conductors, we should have a pressure in the pipe, at certain points, of not less than 1,500 pounds per square inch, due to the greater elevation of other parts of the line.

The limitations of pneumatic transmission have not been accurately determined, and it is probably possible to obtain better results by this means than have as yet been realized in practice. Air compressors, however, have been made for many years, and as compared with electric generators are much less efficient. To compress a gas means necessarily to develop heat, and this, so far as our purpose of transmitting power is concerned, involves loss; and while it seems probable that by using very high pressures in pipes of comparatively small diameter, the cost of a system transmitting by compressed air may be much reduced, as compared with present practice, there are certain difficulties to overcome, and up to the present time no satisfactory method of surmounting these difficulties has been demonstrated.

The fourth solution of the problem of transmission is by electricity; that is, by ether under unbalanced pressure. Note, if you please, the interesting sequence of the several solutions of this problem of transmitting power: First, a solid; then, a liquid; then, a gas; and, finally, something (if I may use the expression) more volatile, more subtle even than a gas; something which, in itself, we can neither touch, taste, smell, hear, nor see; something that we know only by its effects; something so elusive that for centuries the world did not know that it existed. Is it not significant of the progress of engineering science that it should thus have advanced from those agents directly perceptible to our senses to one which our physical senses can not perceive—from the material to the immaterial?

And now, what is ether? What is electricity? And how is power transmitted by electricity? These are questions that the science of the present day can not fully and satisfactorily answer. But we are not totally ignorant of the nature and characteristics of this agent that we are using with such confidence and assurance of results, and it is not difficult to form in our minds a rough conception, useful as a working hypothesis, though not susceptible of proof, and very properly subject to criticism from various points of view. We know from optics that there is a medium that is not a solid, not a liquid and not a gas. We may exhaust the air from a glass vessel and light will still pass through it. Air, therefore, is not the medium by means of which light is transmitted. Evidently, there is something still in the glass vessel which serves to convey the ray of light. We know, also, that the space between the earth and the sun is not filled with air, and yet it is traversed by light. We assume, therefore, that the interplanetary spaces are filled with this same something, and, for convenience, we call it ether, and proceed to study its phenomena. The science of optics, which deals with the propagation of light through this medium, is so well established by observed facts, and by general theories which explain and interconnect these facts, that practically nothing within the range of human knowledge is more certain than that something which we call ether does exist and that it pervades all space and all matter. In 1888, the German physicist, Hertz, proved beyond the shadow of a doubt that electric and magnetic phenomena have to do with this same medium.

Electricity is defined as ether in a state of strain, or, more properly speaking, in a state of unbalanced strain; this strain manifesting itself along the conductors of an electric circuit connected at one end to a dynamo in action, and at the other to a lamp, motor, or other translating device. Professor Lodge advises us to conceive of an electric conductor as a hole through the ether. The static balance of the ether being relieved or unbalanced along the surface of the conductor, and the strains to which our world of ether is subject (somewhat as water at the bottom of the sea is under pressure) being unbalanced along the line of the circuit, the ether transmits along the surface of the conductor the strain or pressure imparted to it by the dynamo. We need not pause to consider whether the strain is transmitted by the ether within the copper conductor or along its surface, but we may imagine that following the path of the conductor from the dynamo to the motor and back again from the motor to the dynamo, a loop, or chain, of ether transmits a stress or strain from the dynamo to the motor, somewhat as a belt conveys power from a driving to a driven pulley.

In the telegraph, and more recently in the telephone, we have become familiar with some of the characteristics of electric transmission; notably the fact that it is practically instantaneous in its action. We press a key in America, and the mind of an operator in England almost instantly has our thought. The mechanical movement of the transmitting instrument here causes a mechanical movement of part of the recording instrument there. It is as if they were connected by a rigid bar less compressible than steel, yet weighing nothing.

We are less familiar with the fact that electricity is strong, but observations of thousands of street railway cars driven at high speeds and up heavy grades, and of motors operating heavy machinery in mills and factories, is teaching us this also. As a matter of fact, the power transmitted through a copper conductor of given section, at the potential now being employed by the Niagara Falls Power Company in transmitting power to Buffalo (between 10,000 and 11,000 volts), is sufficient to break many steel cables of equal section moving 10 miles per hour and attempting to transmit equal power. At 10,000 volts a single phase circuit, consisting of a copper conductor one inch in section and carrying 1,000 amperes, transmits more than 13,000 horse-power. The strain upon a cable transmitting this amount of power mechanically and moving 10 miles per hour would exceed 1,000,000 pounds, enough to break eight steel cables one inch in section, and having the high ultimate tensile strength of 125,000 pounds per square inch. In three-phase transmission, such as is used between Niagara and Buffalo, the results in this respect are still more remarkable, but to consider three conductors makes our comparison with a steel cable less evident.

Power transmitted by electricity is delivered in a form adapted to a remarkable variety of uses, and, as compared with power transmitted by any other system, possesses important advantages. Supplied to a motor it performs mechanical work at efficiencies ranging from 60 to 95 per cent, depending upon the size of the motor. Delivered to an arc lamp it produces from 1,500 to 2,000 actual candle-power per horse-power. Used to supply incandescent lamps it produces light agreeable in quality, possessing substantial advantages over other forms of illumination, and developing from 200 to 250 candle-power per horse-power. Conveyed to the terminals of the electric furnace it produces, by synthetic process, various materials new in the arts and of great value; or, traversing the electrolyte of the chemist, it tears apart the very molecules of which matter is composed and segregates their constituent elements.

Unlike shafts, belts and cables, it can be indefinitely subdivided without material loss. It can readily turn corners. It is transmitted vertically with as much ease as horizontally. Unlike water, it never freezes, and, unlike compressed air, it can be delivered from the generating machinery and transmitted many miles at a very high efficiency.

A Case of Severe Dermatitis Following Two Exposures to the X Rays.

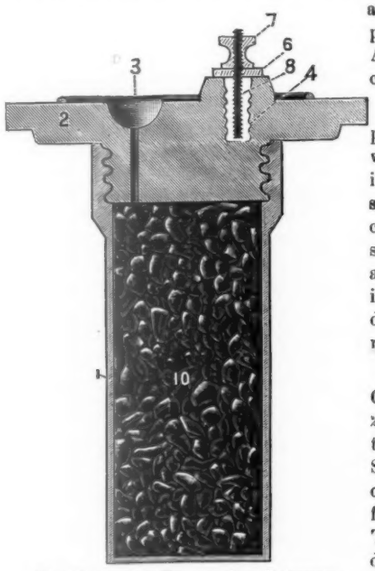
On June 14 M. d'Arsonval presented to the Academy of Sciences at Paris a case, which had occurred in the practice of Dr. Apostoli, of dermatitis following two exposures to the X rays. The exposures were made on May 22 and 28, 1896, the duration of the first sitting being 40 minutes, with the Crookes's tube at a distance of 15 centimeters from the skin, and the second lasted 90 minutes, the tube being at a distance of nine centimeters. After the first sitting nothing was noticed except great nausea on the part of the patient. After the second, however, an erythema appeared over the area which had been exposed—namely, the abdominal wall—and this erythema was followed by vesication and an abundant serous discharge. These gradually healed, and by July the patient was nearly well; but in August the whole of the affected surface sloughed and a severe burning pain was felt. No applications to promote healing had the slightest effect, and skin grafting was equally useless. At the end of October, 1896, the application of a current of oxygen was tried and promoted healing in a slight degree. In February, 1897, electric treatment was commenced. Statical electricity was used at first alone and then in combination with high frequency currents. In April, 1897, electric baths were commenced and employed twice a week, the current employed being the undulatory form. These applications had a very good effect, and by June, 1897, the whole affected surface, which measured 17.7 by 13.6 centimeters, was soundly healed. Dr. Apostoli considers that this form of dermatitis may be produced by the tube being too near, the sittings being too long, or even when short if following one another too rapidly or being too many in number. The dermatitis is very slow in healing, and apparently the best method of treatment is the employment of electric currents, both locally, by using statical and undulating currents, and generally, by the exposure of the patient to a high frequency current. —*London Lancet.*

Another Steam Road to Adopt Electricity.

It is reported that the Northern Railroad of New Jersey will be electrically equipped. The road is now, and has been since 1869, operated by the Erie Railroad. The present rental is 35 per cent of the gross earnings, and the lease is terminable by either party on 90 days' notice. The road runs from Bergen Junction, N. J., 21 miles to Sparkill in New York State, and there is a leased line of four and one-half miles from Sparkill to Nyack.

The National Porous Cup Battery.

So many changes have been rung on the construction of the open-circuit battery ever since the first appearance of the venerable Leclanché cell, that any attempt to produce something really novel and more efficient or economical than existing forms would seem to be useless. In the No. 2 carbon cell, however, the National Carbon Company seems to have combined all the desirable features of the older forms of open-circuit batteries, and at the same time added new points of construction which make the battery probably as efficient and desirable as any on the market. The cell, as shown in the illustration herewith, consists of a carbon porous cup, filled with a depolarizer, a circular zinc, and the usual sal ammoniac solution. The carbon porous cup is made by a special process by which the wall is made very porous and it is this porosity that causes the depolarizer with which the cup is filled to be brought into action immediately on



THE NATIONAL POROUS CUP BATTERY.

setting up of the cell. The top, or cover 2, is screw-threaded, as clearly shown, and so treated that it can not absorb moisture; 4, 6, 7 and 8 show the binding post parts and method of insertion in the cover, whereby corrosion of the metal is absolutely prevented. In the usual carbon or clay cells where a depolarizer is used, the element is practically worthless when the depolarizer has given off its strength, and it is then necessary to buy practically a new cell as a renewal. In the National No. 2, however, it is merely necessary to unscrew its cover, empty the carbon cup and refill it with a new charge of depolarizer at a trifling cost. This feature alone would seem to make the battery a very convenient and economical one for all kinds of open-circuit work.

The Brooklyn, N. Y., & Coney Island Electric Railway Company is changing its overhead construction from bracket suspension to span-wire suspension.

ELECTRIC LIGHT FLASHES.

A newly invented wave motor has been established on the ocean front, four miles north of Redondo, Cal., and is said to be successfully running an electric-light plant.

The Arkansas State Penitentiary Board has awarded the contract for the State electric-light plant to the Brown Electric and Manufacturing Company, W. G. Brown, manager, of Little Rock. There were 16 bidders.

On account of the increasing demand for electric light in Paterson, N. J., the Edison Electric Light Company will soon put in another compound steam engine of 650 horsepower. Generators of equal capacity will be required, and the improvement will cost $30,000.

On July 20, the stockholders of the Southern California Power Company will meet at Redlands, Cal., to vote upon the question of bonding the company in the sum of $500,000, to raise money for the construction of a plant for the generation of electric power from the waters of the Santa Ana River, and to convey the electric current to market.

The San Gabriel, Cal., Power Company, which has done considerable work in the way of tunneling, etc., is at present doing no active construction work, and is holding off its contractors for the purpose of settling some legal difficulties that have arisen regarding the irrigators. It is said, however, that when the work does start again it will be pushed rapidly to completion.

The Underground Electric Wire Company was incorporated on June 28 to manufacture and supply electricity for light and other purposes in Syracuse, N. Y., and to construct overhead and underground structures for the purpose of stringing wires. The capital stock is $400,000, and the directors are Orson M. Bangs, of New York city; Benjamin D. Green, of Stamford, Ct.; John F. Gaynor, of Fayetteville, and William B. Kirk, Charles Hughes, Eugene Hughes and Peter J. Mack, of Syracuse.

It is stated that the Edison Electric Illuminating Company, of Brooklyn, N. Y., is erecting the largest high-tension power plant in the world, on property just purchased near Fort Hamilton. It is proposed to distribute this power to the other stations of the company, so that the company can do away with all its other power-generating plants. In the process of distributing the high-tension power to the other stations it will be transformed at the sub-stations to low-tension requirements. It is believed that great economy can be effected in the concentration of the steam outfit at one place.

The judgment of the Special Term of the New York State Supreme Court, vacating an assessment on the capital stock of the Edison Electric Illuminating Company, of Brooklyn, N. Y., has been affirmed by the Appellate Division. The assessors valued the stock at $1,033,974. Justice Cullen, who writes the opinion, holds that the franchise, valued at $945,000, was not subject to taxation, and that the franchise to lay mains and carry on business is likewise exempt. He also holds that the capital stock of the Citizens' Electric Light Company, which is held by the Edison company, is exempt, and that the company is not subject to assessment on personality.

A correspondent writes to the ELECTRICAL REVIEW from Conowingo, Md., as follows: "The Susquehanna Water Power and Paper Company which went into the hands of receivers last November have closed their doors, with little prospects of again starting. The Susquehanna River Electric Light and Power Company, who paid, it is understood, $25,000 cash over two years ago and took an option on this plant at $600,000, don't seem to come up. It was hoped at one time that they would put in the $3,000,000 power plant that they contemplated to furnish Baltimore with light and power. They spent considerable money, as they took options and made payments on land on each side of the river for a distance of 12 miles, and made surveys. The engineers say it is a fine power and can be easily harnessed. I think this is the accepted time for capital to look the matter up, as this valuable plant is for sale."

Miller-Knowlton.

The elegant residence of Mr. Jas. E. Keelyn at Evanston, Ill., was the scene (of a brilliant, though quiet, gathering on July 3 last, the occasion being the marriage of Miss Antha Knowlton to Mr. Kempster B. Miller, of the Western Telephone Construction Company. The ceremony was performed by the Rev. Dr. Henson in the presence of a circle of the bride and groom's more intimate friends, and after an informal lunch the happy couple departed at once on an extended trip to the Pacific coast. Mr. Miller is a graduate of Cornell, class of '93, and since his sojourn in Chicago has won an ever-widening circle of friends through his many sterling qualities. He is considered exceptionally fortunate in winning the affections of Miss Knowlton, one of Philadelphia's fairest daughters, who so brilliantly graduated at Vassar in the class of '90. The ELECTRICAL REVIEW extends hearty congratulations, and hopes that the coming years may be their happiest.

By the bursting of three pulleys on a revolving shaft in the testing department shop, No. 11, of the General Electric Company's plant about a week ago, the interior of the shop was wrecked. R. F. Yates, who is taking a student's course, was severely injured, and a large number of men had narrow escapes from being hit by flying pieces of iron. Several large machines were wrecked, and nearly every pane of glass in the windows was broken by the shock. The damage will amount to nearly $1,000.

The Fatigue of Metals.

An investigation of the fracture of a steel rail on the Great Northern Railway, in England, has brought out some interesting facts bearing upon the question of the fatigue of metals, says the *Scientific American*. On the occasion in question a Bessemer steel rail, which had been in use for about 22 years, broke into nearly a score of pieces beneath the wheels of a Great Northern express train, causing a serious wreck. An examination was carried out by Mr. Thomas Andrews, M. Inst. C. E., and in a paper on microscopic observation on the deterioration by fatigue in steel rails, he gives some very interesting particulars regarding the appearance of the broken fragments of the rail. The composition of the rail was as follows: Carbon, 0.53 per cent; silicon, 0.12 per cent; phosphorus, 0.08 per cent; sulphur, 0.09 per cent. The microscopic examination revealed a large number of fine hair cracks, and Mr. Andrews concludes that the continual hammering of the wheels had developed these minute fractures throughout the body of the metal and produced the remarkable simultaneous failure which occurred at many points of the rail. The occurrence of such hair-like cracks in manufactured steel is not uncommon, and just what it is that causes them is an open question. It is possible they occur in the process of rolling, and that in the case of steel rails they are to be traced to this origin more than to the severe concussion of the traffic which passes over them. This supposition is borne out by the fact that such cracks are to be found in the newly finished output of the mills, and if they are to be prevented, the cure will have to be found in the process of manufacture. The fatigue of metal is a pretty theory, and one which was largely accepted a few years ago. To-day, however, it is believed that such fatigue does not take place, except, perhaps, in cases where the metal is subjected to very violent and long-continued strains.

Cincinnati Electrical Club.

The regular monthly meeting of the Electrical Club was held on Thursday, July 1, at the club-room in the College Building. Mr. H. S. Rogers, division engineer of the General Electric Company, presented a very interesting paper on the monocyclic system, in which he set forth, in a very clear manner, the various systems of alternating-current transmission now in use, together with the advantages and disadvantages of each. The club decided not to hold the regular monthly meetings during August or September, but the club-room will be open at all times to members.

The State Railroad Commission has granted an application of the Oneonta, N. Y., Street Railway Company for permission to change its motive power from horses to electricity. The Olean street railway has received the board's approval of an increase in its capital stock from $16,000 to $300,000.

ADVANCE INFORMATION

New Electric Railways.

WILLIAMSPORT, PA. — A charter has been granted to the Montoursville Passenger Railway Company, to operate by single or double track, over the State road from this place, through Loyalsock Township, to Montoursville. The capital is $75,000. William V. Massey, Edington, president; M. R. Massey, Edington; C. F. Trego and W. H. Hassenplug, Philadelphia, and Harry M. Van Zandt, Harrisburg, are the stockholders.

FAIRTON, N. J.—A movement is on foot to have the Bridgeton trolley road extended to this city.

NEWTOWN, QUEENS COUNTY, N. Y.—The DeKalb Avenue & North Beach Railroad Company has been incorporated by Henry B. Hyde, Louis Fitzgeraid, Alfred Wagstaff, Duncan B. Cannon, John N. Partridge, John E. Hains, Thomas Clark, J. V. Thomas, Ennis Benton and George W. Benton, to operate an electric street surface road. Capital stock, $200,000.

EASTON, PA.—The Northampton Electric Railway Company has been incorporated. Capital stock, $300,000. The incorporators are James Kerr, Clearfield; George S. Good, Lock Haven; J. Frank Snider, A. O. Smith and G. S. Hues, Clearfield.

SARATOGA, N. Y.—The Saratoga Northern Railway has been incorporated with a capital stock of $1,000,000. The company proposes to construct an electric railroad from Saratoga Springs to Wilton and to Mount MacGregor in Saratoga County, a distance of 11 miles. The directors are A. C. Kaufman, Harrison Hale Schoff and Edward A. McAurice, of Pittsfield, Mass.; J. B. Robertson, of New Haven, Ct.; C. E. Arnold, H. McGonegal and L. C. Jordan, of New York city; A. J. Voyer, of Albany, and J. B. Hampton, of Philadelphia.

PORTVILLE, N. Y.—The work of building the Olean & Portville Electric Railway has been begun.

NEW KENSINGTON, PA.—A new trolley road that will span the northern portion of this county is in contemplation. It will start at this place and terminate at Greensburg. It will pass through Export, Murrysvill and Delmont. Colonel Wayman, of New Kensington, is at the head of a syndicate that proposes to connect those towns.

FAIRTON, N. J.—A movement is on foot to have the Bridgeton trolley road extended to this place.

CHICAGO, ILL. — The Automatic Electric Traction Company has been incorporated. Capital stock, $30,000. Incorporators, Zebulon Foster, Edward Foster, Stanton Foster and others.

COLUMBUS, OHIO.—The Tricity Interurban Railway Company, of Ashland, has been incorporated by Bert J. Hank, Edwin J. West, G. A. Ullman, J. R. Swartz, E. F. Shelley, S. J. McCready, Thomas Brown, Thomas M. Beer, H. A. Thomas, O. G. Carter, Jr., S. C. Frank, E. J. Grosscup, J. W. Brindle, G. Hess, S. H. Graybill and J. F. Johnson. They will build an electric railway from Loudonville through McKay, Hayesville, Ashland, Savannah and Ruggles to New London in Huron County. Capital stock, $10,000.

RICHMOND, IND.—An electric line from this place to Webster, Economy and Blountsville, is talked of.

NEW YORK, N. Y.—The Olean, Rock City & Bradford Railroad Company, of Pennsylvania, and the Olean, Rock City & Bradford Railway Company have consolidated, under the name of the Olean, Rock City & Bradford Railroad Company, with Frank E. Lowe, treasurer; W. B. Ferguson, president, and George E. Rogers, secretary.

HARRISBURG, PA.—The Pembroke Railway Company has been incorporated by Edward Thompson, Nathan Spring, Edward D. Wadsworth, Washington W. Webster and Henry C. Terry, to construct a new suburban line from Cobb's Creek to White Hall, Delaware County. Capital stock, $300,000.

DENVER, COLO.—A long intersuburban electric line is to be built in the Fox River valley, Wisconsin.

ST. PETERSBURG, FLA.—The West Coast Development Company has laid foundation for electric light plant.

Electric Light and Power.

OWENSBORO, TENN.—The question of building an independent electric light plant is being agitated again at this place.

WILDWOOD, N. J.—An electric light plant is being established midway between Holly Beach and Wildwood.

WOODSTOCK, ILL.—This city has made an appropriation of $10,500 for the erection of an electric light plant.

MARQUETTE, MICH.—A special election will be held at this place July 23 to vote on the question of bonding the city for $35,000 for additions to the electric lighting plant.

PINE BLUFF, ARK.—D. C. Bell, chairman of electric light committee, can give information concerning construction and operation of an electric light plant A $20,000 plant is suggested.

WILKINSBURG, PA.—The Rural Electric Light Company has been incorporated by J. J. Campbell, J. F. Fleming, R. W. Hezlep, William B. Hughes and David S. McCann. Capital stock, $10,000.

NEW YORK, N. Y.—The Zircon Light Company has been incorporated by Theodore Newton, Orlando Hastings and David Baker to manufacture incandescent lamps. Capital stock, $20,000.

CUMBERLAND, MD.—Isaac Hirsch can give information concerning contemplated erection of electric light plant.

COLUMBUS, MISS.—The Columbus Gas Company has awarded contract for the erection of a 1,200 light incandescent plant.

ST. LOUIS, MO. — The Imperial Electric Light, Heat and Power Company will build a new electric light station in this city.

HILLSBORO, N. C. — The Eno Cotton Mills, Thomas H. Webb, superintendent, will put in an electric light plant.

MARCELLUS, MICH.—It is reported that an electric light plant is to be established here.

CAMDEN, N. J.—There is a movement on foot at Blackwood and Chew's Landing for the establishment of an electric light plant at the latter place to furnish light for those two towns and the surrounding country as well.

HARTFORD, CT. — The Treasury Department has awarded the contract for lighting the post office to the Hartford Electric Light Company.

CARROLLTON, IND.—Jett Brothers have decided to put in a 300-light electric light plant at this place.

MARLIN, TEX.—The Marlin Electric Light and Power Company is putting in new machinery, including a 125 horse-power Corliss engine.

New Telephone and Telegraph Companies.

WORCESTER, MASS.—I. L. Currier is the promoter of a new telephone company, which is to be incorporated, with a capital stock of $150,000.

BURNT MILLS, N. Y.—The Bell Telephone Company has put up a line from here to Ballston Lake.

NEW ORLEANS, LA.—J. J. Fowler will organize a $200,000 company to construct and operate a new telephone exchange and system, wires to be laid underground.

CHATTANOOGA, TENN.—The East Tennessee Telephone Company will build a telephone line from Chattanooga to Atlanta.

CHARLESTON, S. C.—The Carolina Mutual Telephone Company telephone exchange is now in active operation.

New Incorporations.

NEW YORK, N. Y.—The American Electrical and Maintenance Company has been incorporated. Capital, $250,000.

INDIANAPOLIS, IND.—The O. C. Irwin Engineering and Electric Company has been incorporated. Capital stock, $50,000. Directors, John J. Johnson, O. C. Irwin, Peter C. Weyenberg, Samuel R. Waters and Benjamin F. Nysenwands.

Increase of Capital.

ST. LOUIS, MO.—The Bell Telephone Company, of Missouri, has increased capital stock from $400,000 to $2,000,000.

Momence and Kankakee, Ill., are to be connected with 12 miles of electric road, owned and operated by the Bradley line. The equipment at the start will include two large combination cars for passengers and freight, provided with double motors of 50 horse-power each. The speed capacity will be 20 miles an hour, but probably 10 miles an hour will be the running time, making the schedule a trip each hour. Work on the new line will be commenced as soon as the right of way is secured.

A Valuable Street Railway Reference Book.

The 1897 edition of "American Street Railway Investments"—the well known "Red Book" Supplement to the *Street Railway Journal*—has just been issued from the press of the Street Railway Publishing Company, New York. The special features of arrangement, which have given this a prominent place among financial manuals, are found this year as usual, and include the tabular presentation of gross receipts, operating expenses and balance sheets for from three to five years, by means of which a company's complete financial statements may be examined for surreptitious concealment of expenses or profits; the "dates of information," which are appended to each report, and the authenticity of the information, as shown by the statement that out of 1,262 companies in existence in the United States and Canada, over 80 per cent have sent in "approved" reports from proof sheets sent to them before publication, while nearly all the remainder have been brought up to date from official sources of information. An unusual number of carefully prepared and finely engraved maps of street railway properties is found in the "Red Book," and adds much to its value. The arrangement of indexes and their completeness is an excellent feature of the book.

It is interesting to note that of the 1,262 corporations reporting, 939 are operating companies, 206 are leased companies and 117 are not yet in operation, but their roads are under construction. Among the special features are a "Review of the Year," in which is a brief exposition of the chief events bearing on street railway results happening during the last year in the principal cities of the country, and a table of "Gross receipts in 1895 and 1896," showing the percentage increase or decrease in receipts for every system whose gross receipts exceed $25,000. The information contained in this table is of much value, particularly as the companies are arranged according to magnitude of operations in 1896, so that each company can easily find out what others of its class are doing.

Chicago Electrical Association Takes An Outing.

On Friday evening, June 25, the members of the Chicago Electrical Association, accompanied by lady friends, accepted the hospitality of Mr. W. A. Harding, of the Calumet Electric Railway Company, in the form of an illuminated and spectacular trolley ride over the lines of that company. The evening was particularly fine, the preparations for transportation, illumination and entertainment were entirely complete, and the temper of the gathering was as full of vivacity as is usual with technical aggregations. At the close of the trip, after four hours' condensed enjoyment, vociferous cheers were tendered Mr. Harding and the Calumet Electric Railway Company, with a final for the association itself.

Kindred.... ...Interests

The Herzog Teleseme Company has removed from 55 Broadway to 1123 Broadway, corner of Twenty-fifth street, New York city.

The Joseph Dixon Crucible Company, Jersey City, N. J., has issued its usual monthly calendar blotter for July, carrying an appropriate design printed in red.

The Beacon Lamp Company, New Brunswick, N. J., has issued an unusually complete catalogue describing and illustrating its extensive line of incandescent lamps for every service.

The Crocker-Wheeler Electric Company, 39 Cortlandt street, New York city, has issued a pamphlet in which its extensive line of motor-dynamos and dynamotors are fully illustrated and described.

A contract has just been closed by the American Engine Company, of Bound Brook, N. J., for a 35-kilowatt direct-connected American-Ball engine and generator to be installed in the Pension Record Office at Washington.

The Sinking Fund Commissioners of New York city recently awarded the contract for putting in an electric-lighting plant in the new Criminal Court House to J. F. Buchanan & Co., of Philadelphia, for $37,770. There were four other bidders.

Notwithstanding the unusually cold weather experienced all over the country during the month of May, the Electric Appliance Company, of Chicago, report that the few days of hot weather in June started the fan business going in good shape, and gives promise of a prosperous fan season. The Electric Appliance Company state that they still have some copies of their fan motor catalogue left, which they will be glad to send to the trade, upon application. It is a complete book of all styles of fan motors.

The F. & L. flush push-button switch is the Electric Appliance Company's latest specialty. This switch, which must be seen to be appreciated, is a very simple and compact device, the size of the face plate being no larger than the ordinary two-button gas key. The face plate is nickel-plated, with pearl buttons. One of the merits of the switch is the ease with which it is operated. It is also a less expensive switch to make than any first class push-button switch ever offered heretofore, and the Electric Appliance Company is thus enabled to offer it at even a lower price than the regular snap-flush switch. It is at present made only in single-pole style, with a capacity of five amperes, although other sizes and capacities are now in preparation. The F. & L. flush switch promises to find a large and useful field.

The New York & Staten Island Electric Company are erecting at Livingston, Staten Island, a new power-house of modern construction. The walls of the building are brick and the roofs have steel trusses covered with corrugated iron. The roofs are arranged with suitable monitors with skylights for light and ventilation. On the building is a large wire tower of steel construction. The engine-room is arranged for a traveling crane of 15 tons capacity. The building has been constructed with the idea of having it absolutely fireproof, and arranged in an up-to-date manner. The roof of the engine and dynamo portions of the building is lined underneath the corrugated iron with the Berlin Iron Bridge Company's anti-condensation fireproof roof lining. The Berlin company have the contract also for furnishing and erecting all the steel framework and covering for the plant.

The first large underground work in St. Louis is now under way, and the Standard Underground Cable Company, of Pittsburgh, New York, Chicago and St. Louis, has recently secured from the Bell Telephone Company of Missouri, and the Kinlock Telephone Company (both of St. Louis), two of the largest contracts ever let in this country (and probably in the world) for telephone cables, these two orders comprising all the underground work in St. Louis yet contracted for, and constituting the complete cable equipment for both telephone companies. Both contracts were secured in the face of the most severe competition, and the well known excellence of the telephone cables manufactured by the Standard Underground Cable Company largely influenced the placing of the order with them, as the prices were exceedingly close. To fill these contracts there will be required more than 650,000 feet of cable, which in turn requires about 100,000,000 feet of No. 19 B. & S. G. copper wire and 2,000,000 pounds of lead. To meet this extraordinary demand, the manufacturing facilities of the cable company in the paper-covering department have recently been doubled, which places them in a position to not only handle this enormous volume of business rapidly and easily, but at the same time to fill, without any delay, the large and constantly increasing orders for telephone cables, electric light and power cables, rubber-insulated wire, etc., which are being daily entered. Considerably more than one-half of this cable will be installed by the cable company; they have contracted to turn the cable system of the Kinlock company over to that company, complete and ready for service. A large force of expert workmen will be employed for nearly a year in this work, under the direct supervision of the St. Louis office.

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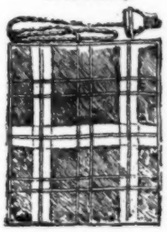

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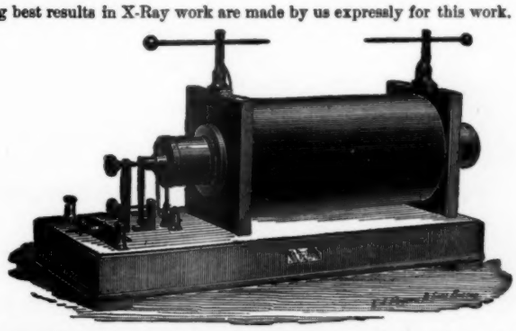

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 22, 1897.

584,785 Electric gas lighting and extinguishing apparatus; G. F. Krieger, Kiel, Germany.

584,798 Burglar alarm; H. M. Sutton, Dallas, Tex.

584,810 Telephone transmitter; R. S. Barnum, Chicago, Ill.—Consists of an electrode provided with one or more cavities therein for the reception of finely divided particles of conducting material, and one or more tufts of elastic fibrous material arranged within said cavities.

584,819 Telephone annunciator call-bell and fire alarm; M. Garl, Akron, Ohio.

584,843 Automatic switch for electric circuits; R. Belfield, London, England—An automatic circuit opening and closing switch comprising stationary and movable contacts, a local circuit having its own source of current, an electric motor therein, rotatable in one direction only, switch actuating mechanism intermediate to the rotating member of the motor and the movable contacts, a main circuit and an electromagnetic device therein for opening and closing the motor circuit.

584,848 Electro-magnet; C. P. Bostian, Milton, Pa.—An electro-magnet having one or more perforations through its core, and a rod of magnetizable material within and nearly filling each perforation, said rod or rods being insulated from the core.

584,853 Therapeutic electric-current generator; E. W. Chellis, Erie, Pa.—Consists of the flat cylindrical casing, and spring-motor train located therein, of the cylindrically arranged field-of-force magnets extending around, within said casing, and the relatively flat armature rotating within said field-of-force magnets, and driven by the motor train.

584,856 Controller for electric motors; H. P. Davis, Pittsburgh, Pa.—An electric circuit and a resistance normally included therein, of a switch and an actuating magnet for gradually reducing the amount of said resistance in circuit, means for short circuiting said magnet when the minimum resistance is secured, and a second magnet for maintaining said last-named condition until the circuit is interrupted.

584,867 Arc lamp carbon; T. M. Foote, Chicago, Ill.—A carbon for electric arc lamps having a longitudinal groove therein, including the center or core of the carbon, so as to penetrate into the crater and apex formed at the end of said carbon.

584,868 Telephone; J. T. Gent, Leicester, England—Consists of a diaphragm, a variable resistance consisting of a suitable conducting material, a rotatable containing or holding receptacle for said material, a movable telephone support and intermittently operated intermediate connections between said support and the receptacle.

584,871 Telephone bracket; A. Y. Gordon, Massillon, Ohio.

584,873 Electric railway; F. W. Hunter, Cranford, N. J.

584,911 Electric railway system; G. Westinghouse, Jr., Pittsburgh, Pa.

584,918 Electric railway trolley; E. M. Bentley, New York, N. Y.—A pivoted arm, a stop for limiting its upward movement, a movable end section thereon adapted to bear against the underside of the conductor and make contact therewith.

584,936 Electric conductor; I. W. Henry, New York, N. Y.

584,957 Electro-therapeutical apparatus; F. J. Patten, New York, N. Y.

584,983 Electric arc lamp; A. Bureau, Brussels, Belgium.

585,019 Apparatus for electric thermal treatment of metals, ores, etc.; G. D. Burton, Boston, Mass.—An electrolytic heating device, a main tank adapted to receive the electrolytic solution and provided with a well, in combination with a second tank provided with a fluid conductor adapted to conduct the solution to the well, whereby the well may be kept constantly full to overflowing.

585,026 Tireless insulator; R. Delery, New Orleans, La.

585,030 Magnetic circuit-breaker; W. E. Harrington, Philadelphia, Pa.—Consists of a switch and contacts, a solenoid coil and core vertically movable therein, a switch arm approximately parallel to the core when the switch is closed and an independently movable means above the core for communicating the force of the impact of the movable core to the switch arm, to throw it out of contact.

585,040 Method of melting iron by means of electricity; C. G. P. De Laval, Stockholm, Sweden.

585,047 Conductor for underground electric railways; C. Petersen, San Francisco, Cal.

585,072 Auxiliary fire-alarm system; R. E. Alexander, Yonkers, N. Y.

585,112 Controller for elevators; C. O. Lenz, Providence, R. I.—Consists of a valve through which fluid may pass to the operating mechanism of the car, and an armature lever for actuating the valve, a magnet adapted to act on said armature when energized, an electrical circuit, including a source of electrical energy and open contacts, and a door adapted to close said contacts when opened.

585,137 Multiple filament regulating incandescent lamp; C. Truitt, Columbia, Mo.

585,188 Electrical alarm for door locks; P. V. Vandevelde, Corona, N. Y.

Infringement Suit on Snap Switches.

A hearing was given recently by Judge Putnam, in the United States Circuit Court at Boston, on the bill in equity brought by the Hart & Hegeman Manufacturing Company, of Hartford, against the Anchor Electric Company, of Boston, and others, asking for an accounting and an injunction to restrain the defendants from the alleged infringement of original patent No. 459,706, granted September 15, 1891, to Gerald W. Hart for an improvement in electric snap switches, and the patent as reissued on December 12, 1893, No. 11,395.

Street Railway Accident in Pittsburgh.

In a street-car accident at Pittsburgh, on July 6, 20 persons were more or less hurt, six mortally. At 11 P. M. six cars, only a few feet from each other, were coming down a steep grade. A fuse burned out in the first car. The motorman threw on the air-brake and stopped short. The car immediately behind crashed into the first one, and those behind jammed up against the second. Men, women and children climbed pell-mell through windows and doors, and half the injuries were caused by falls on the street pavement.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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Flake. "Electricity and Electrical Engineering"	2 50	1 00
Haskins. "Transformers: Theory, Practice and Application"	1 25	0 75
Houston. "Electrical Dictionary," old	——	1 00
Prindle. "Electric Railway of To-day"	0 50	0 25
Hamilton. "Origin of Energy"	2 00	0 75
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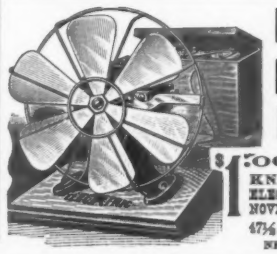

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